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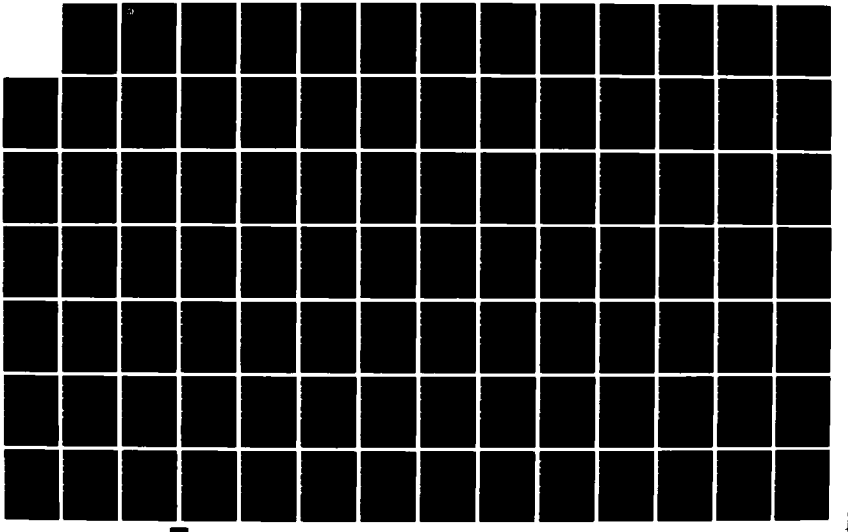
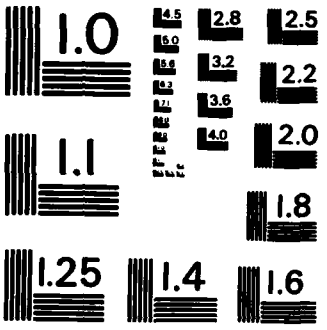
UNCLASSIFIED ISA(WC)-101 N66001-84-D-0032 F/G 13/8 NL





ISA (WC)-101
14 September 1984

FINAL REPORT

ASW and Support-Ship Corrosion-Control (CC) Program Pilot SIMA CC Shop

Contract N66001-84-D-0032, Delivery Order 0003

Prepared for:

COMMANDER
NAVAL OCEAN SYSTEMS CENTER
SAN DIEGO, CALIFORNIA 92152

In support of:

Commander, Naval Surface Force, U. S. Pacific Fleet
N81 (IMA Coordinator)
Naval Station, San Diego, California

and

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

from p. i

The feasibility of the COMNAVSURFPAC IMAs to deliver the 15 NAVSEA designated corrosion-control (CC) systems is evaluated and ranked. Alternate SIMA (San Diego) Pilot CC Shop configurations and manning levels are developed for providing technical assistance for the CC systems and delivering wire-sprayed aluminum ~~(Sys. 1 & 2)~~ and electrostatic sprayed ~~(Sys. 4)~~ coatings services to tended ships. The major Pilot CC Shop equipment is an engineered portable/containerized system for delivering the wire-sprayed aluminum coating which meets the functional requirements of DoD-STD-2138(SH) and the NAVOSH and EPA requirements. A wire spray industrial process instruction conforming to DoD-STD-2138(SH), a test plan and POA&M for a one-year service test are developed.

17. Document Analysis a. Descriptors

Corrosion
Aluminum
Metallizing
Electrostatic Spray
Paint
Ships
Thermal Spray
Intermediate Maintenance Activity
Corrosion Control Shop
Process Instruction

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement: For sale by the Defense Technical Information Center.	19. Security Class (This Report) Unclassified	21. No. of Pages 125
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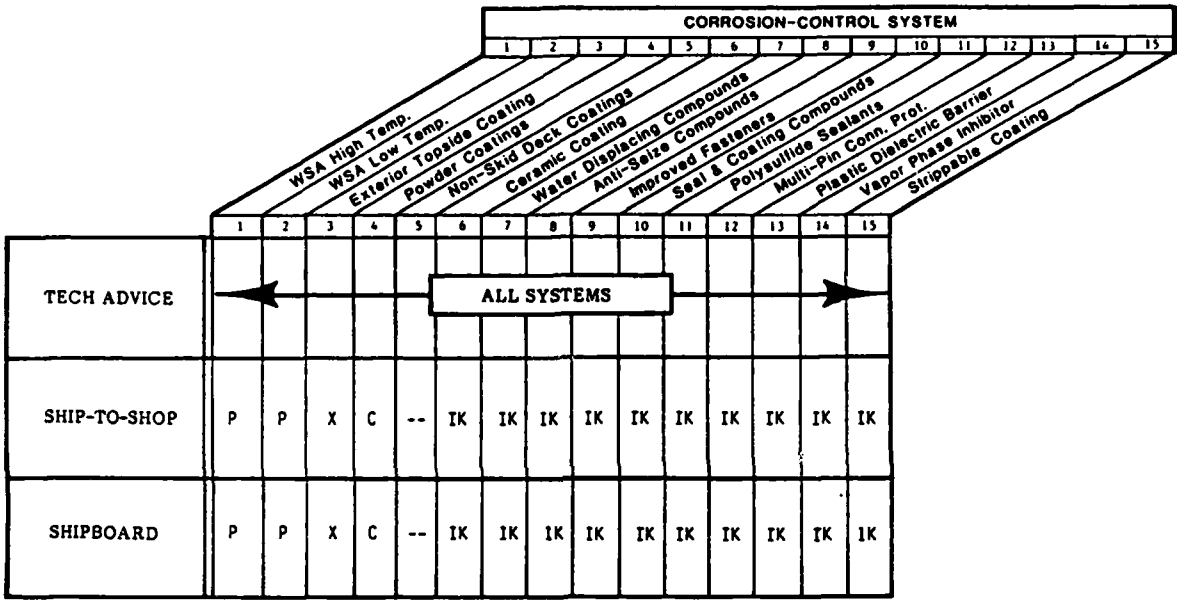
SUMMARY

PROBLEM: The Navy is introducing improved shipboard corrosion-control (CC) coating systems in new construction and in the maintenance, repair and overhaul of ships-in-service. A Senior Navy Steering Board has proposed that Type Commanders and their Intermediate Maintenance Activities (IMAs) identify requirements and fully develop the capability to perform a full spectrum of CC services. The majority of IMAs currently lack manning and shop organization to provide CC services. Some SIMAs, however, have limited facility industrial plant equipment (IPE) and processes to provide CC services. COMNAVSURFPAC (N81) IMA Coordinator initiated a program to analyze and install a pilot CC production capability at SIMA (SD).

SCOPE AND APPROACH: The scope and approach included a literature review; liaison with cognizant NAVSEA Codes, Naval Shipyards, DTNSRDC (Annapolis) and industrial activities; evaluation and ranking of those NAVSEA-designated CC systems feasible for SIMA San Diego (SD) delivery; development of industrial equipment and facility installation alternatives for a SIMA (SD) Pilot CC Shop that would be efficient, operable/maintainable by IMA personnel, meet OSHA and EPA requirements and be compatible with the SIMA Equipment and Facility Upgrade Program; development of Process Instructions for CC systems selected for delivery; and development of a Service Test Plan. Continuing review and CNSP (N81) and SIMA (XO & 3800) feedback were obtained through the eight letter reports issued and two In-Process Reviews conducted during February to August 1984.

CONCLUSIONS/ACTIONS:

1. Establish "Small" Corrosion-Control (CC) Shop and deliver 14 of the 15 CC systems using the Flame Spray, Incorporated (FSI) Model 5003 portable/ containerized wire-sprayed aluminum unit (Sections 4.2.5 and 10.1).

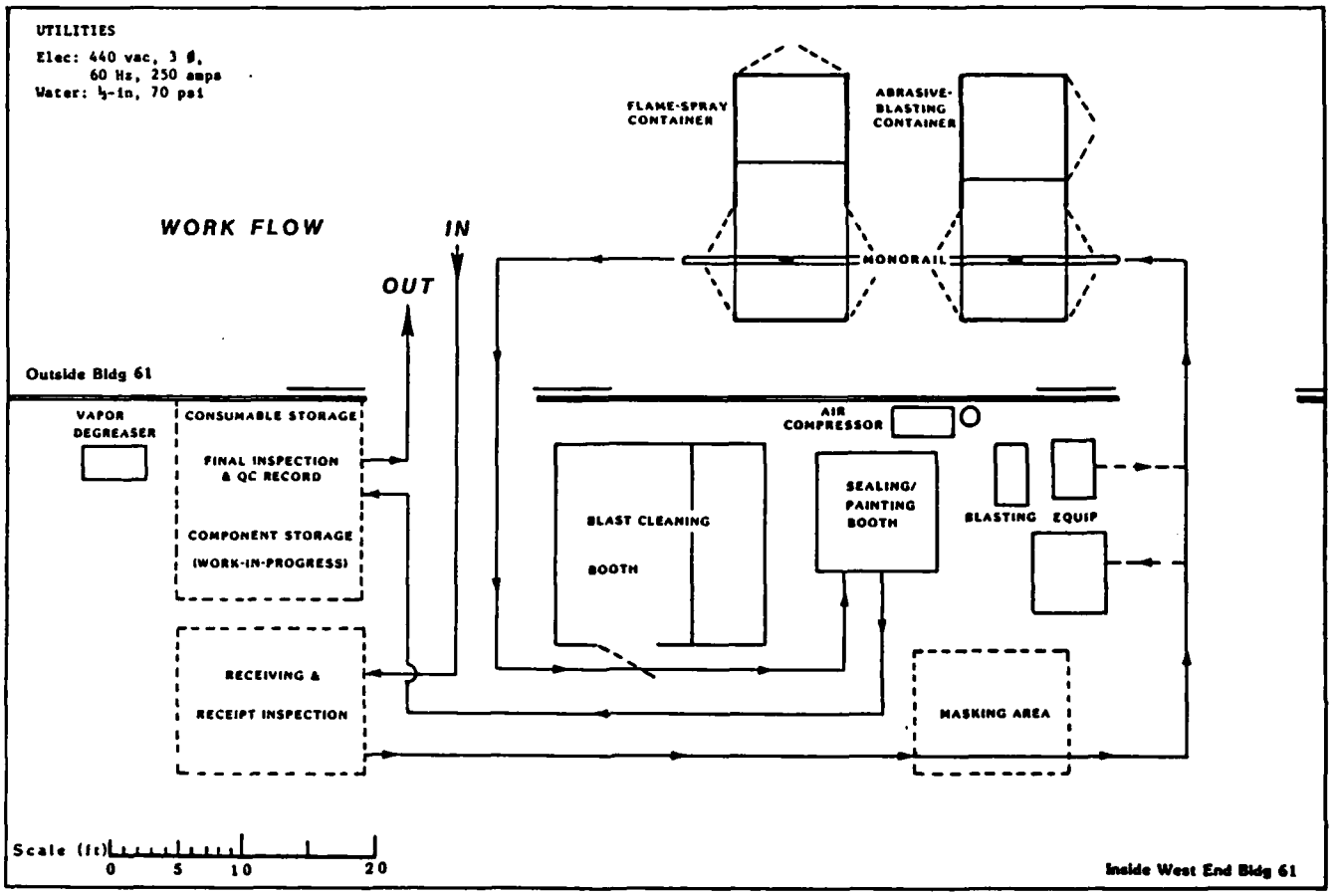


P = Production
X = As required to seal components preserved w/WSA (Sys. 1 & 2)
C = By contractor support
IK = Installation Kit as required for proper installation of components preserved w/WSA (Sys. 1 & 2 and 4)

A-1

2. SIMA (SD) has established Shop 06I, Code 3850, to be the Pilot CC Shop and has assigned 6 personnel (MMC (Shop Supervisor), MM1, BT2, HT-2, EN-2, and HT-3). (Section 5.2.2 and 5.2.4.3).

3. Two Pilot CC Shop equipment lists and installation alternatives have been developed. Alternative 2, FSI Model 5005, has been selected for implementation for a one-year service test. (Section 10.2)



4. The functional flow, data elements and Plan-of-Action and Milestones (POA&M) were developed for the Service Test Plan (Section 11). The POA&M has five major areas:

- Organization (tasks, functions and staffing)
- CC Shop Installation
- CC Shop Operating Instruction/Guides
- Training
- Production Operations

5. Sections 1 through 9 describe the process evolution in determining the scope and feasibility of a SIMA CC Shop. Sections 10 and 11 are the final System Design and Service Test Plan, which resulted from review of the eight Letter Reports and two In-Process Reviews.

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SECTION 1

INTRODUCTION/BACKGROUND FOR OVERALL SIMA CORROSION-CONTROL PROGRAM

1.1 BACKGROUND

A test program on topside Corrosion-Control (CC) completed onboard USS CUSHING (DD-985) in December 1982 has indicated that improved CC coatings can be used to compensate for design deficiencies. Further, CC coating techniques can be utilized on many selected topside equipments on all surface ship classes. The Senior Navy Steering Board (SNSB) has proposed that COMNAVSURFPAC identify Intermediate Maintenance Activity (IMA) requirements and associated costs and fully outfit IMAs to perform full spectrum CC programs. Development of CC programs will benefit operating units of COMNAVSURFPAC by:

- Allowing Combat Systems Technicians more time on preventive maintenance/operation of combat systems equipments;
- Reducing electromagnetic interference (EMI) caused by metal-to-metal contact on topside equipments; and
- Enhancing ship silencing by improving equipment holddown/fastening capabilities.

Accordingly, COMNAVSURFPAC initiated the development of a program for the Shore Intermediate Maintenance Activity (SIMA) to deliver and support the improved CC coatings and techniques now being used by the Navy in new construction ships and in the maintenance, repair and overhaul of ships in service (Ref. 1).

References 2, 3 and 4, attached as Appendix A, have been issued by the Commander, Naval Sea Systems Command (COMNAVSEASYSCOM) and his Industrial Directorate to identify and eliminate shipboard corrosion-control problems. The COMNAVSURFPAC (CNSP) Corrosion-Control (CC) Services Program complements the COMNAVSEASYSCOM directives by establishing a Pilot Corrosion-Control Shop at the Shore Intermediate Maintenance Activity, San Diego (SIMA (SD)) to provide CC service and technical assistance to tended ships.

1.2 OBJECTIVE

The overall objective of the SIMA CC Services Program is to develop a functional capability for SIMAs to deliver CC services, both ship-to-shop and onboard ships. The specific objective is to develop an organizational and a pilot production capability for SIMA San Diego initially, followed by implementation in other CNSP SIMAs.

Five phases are planned to develop and install a production capability for all the COMNAVSURFPAC SIMAs.

Phase I	-	Concept Formation
Phase II	-	Establish SIMA (SD) Pilot Corrosion-Control (CC) Shop and Prepare Service Test Plan
Phase III	-	Conduct Service Test
Phase IV	-	Prepare IMA Upgrade CC Shop Specifications and the Life Cycle Management Support Plans
Phase V	-	Procurement, Installation, Operation, & Maintenance and Modernization

Phases I and II will be accomplished under this Delivery Order.

1.3 ASSUMPTIONS

The following assumptions are made:

A. SIMA (SD) will be able to perform all requisite CC work for equipments/components inducted into SIMA for maintenance, repair and overhaul. For example, the manufacture of topside stanchions and repair of deck machinery by the Hull Repair Group and the Machinery Repair Group, respectively, as Lead Shops will "automatically" schedule and implement the CC work with the CC Shop (Assist Shop for CC services).

B. The personnel selected for assignment to billets in the CC shop will be trained and certified as required.

C. The SIMA (SD) Pilot CC Shop will be able to deliver selected CC services onboard ships.

D. To measure SIMA's capability to implement a CC shop, criteria has to be established. This criteria must be based on requirements that can realistically be applied against each CC system. For purposes of analysis, the following functional requirements are presented:

- Technology developed;
- Industrial Plant Equipment (IPE) developed;
- Process authorized by NAVSEA;
- Process instruction developed/approved;
- Corrosion control information for the SIMA Information Maintenance Management System (IMMS) available; and
- Availability of manning and establishment of supervision.

1.4 SCOPE AND APPROACH

The evaluation of SIMA's capability to provide shipboard CC coating services considered two areas:

A. Initial Application and

B. Maintenance and repair of previously applied CC coatings.

The following requirements were evaluated in both areas:

- Manning;
- Organization;
- Industrial Process;
- Facilities and Equipment;
- Quality Control; and
- Safety and OSHA Requirements.

1.4.1 Methodology

The methodology used to accomplish the overall Delivery Order tasks is given in Figure 1-1. Phase I is directed to concept formulation; Phase II to the physical system design of the SIMA Pilot CC Shop. Formal "feedback" is accomplished at the In-Process Reviews (IPR). Figure 1-2 provides the schedule

for Phases I and II. The major deliverables of this Delivery Order (Phases I and II) are the design, installation plan and the Pilot CC Shop Service Test Plan (Ref. 1).

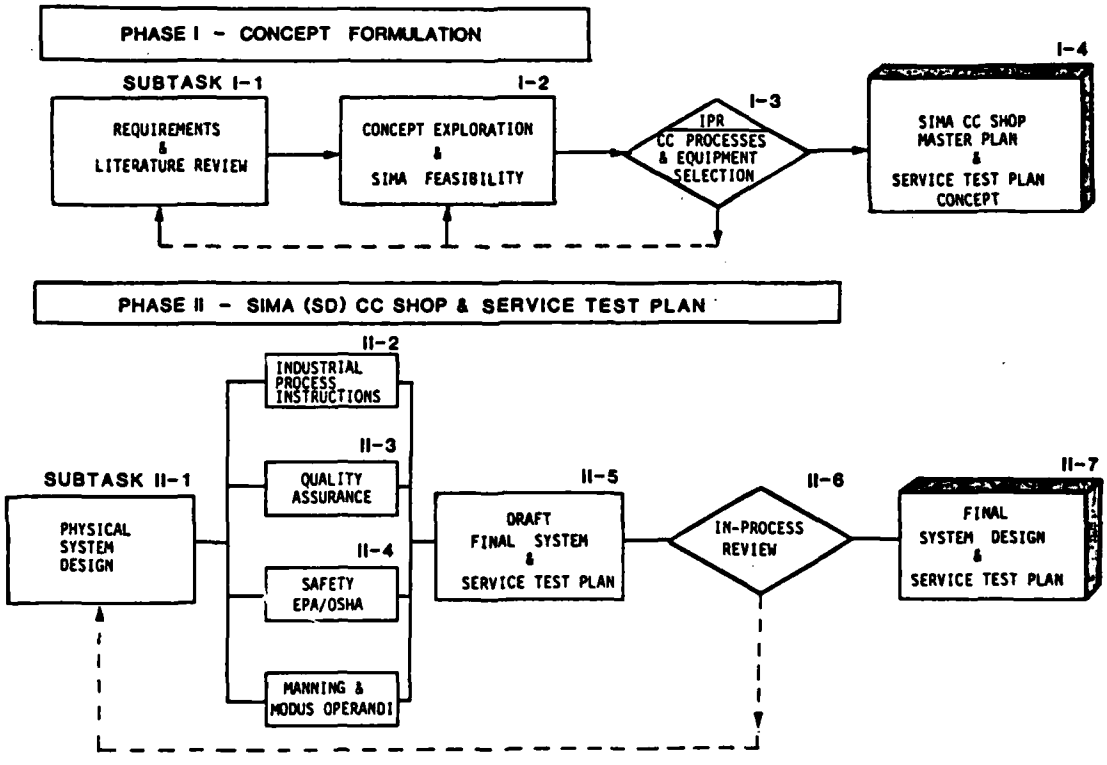

FIGURE 1-1. LOGIC DIAGRAM FOR SIMA (SD) PILOT CC SHOP

PHASE I - CONCEPT FORMULATION

SUBTASK

I-1 Requirements & Literature Review

I-2 Concept Exploration & SIMA Feasibility

I-3 In-Process Review

I-4 SIMA Corrosion-Control (CC) Shop Master Plan & Pilot CC Shop Service Test Plan

PHASE II - SIMA (SD) PILOT CC SHOP & SERVICE TEST PLAN

II-1 Physical System Design

II-3 Safety, EPA, OSHA Summary

II-4 Quality Assurance Program

II-2 Industrial Process Instructions

II-5 Final System Design & Service Test Plan

II-6 In-Process Review - Ltr Report

II-7 Final Report & Initiate Service Test

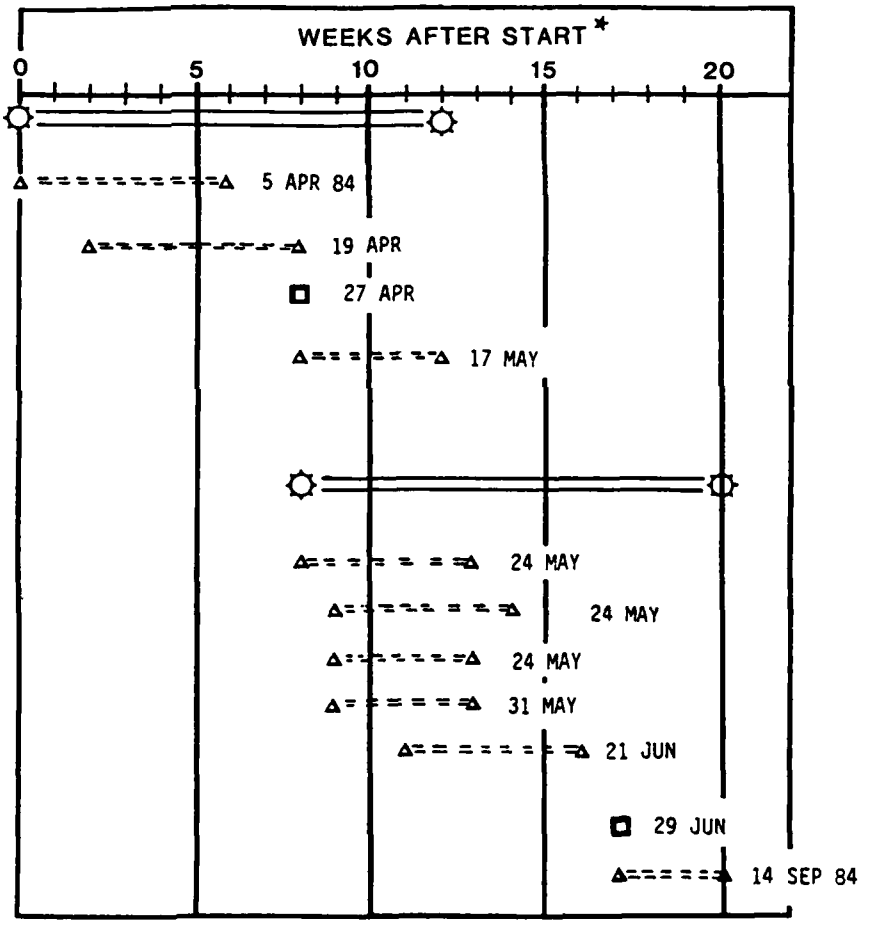

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FIGURE 1-2. SIMA (SD) CC SHOP - DELIVERY ORDER SCHEDULE

1.4.2 PHASE I - Concept Formulation

Concept formulation has four subtasks:

Subtask I-1, Requirements and Literature Review - Conduct critical literature review of the Navy approved surface ship CC systems and their industrial application equipments and processes. Evaluate the industrial equipments, application and quality assurance (QA) process instructions, safety (OSHA), environmental (EPA), labor and consumable materials in regard to SIMA (SD) delivering and/or supporting these coating systems or CC measures for COMNAVSURFPAC ships. Primary technical and specification information source is NAVSEA 05M1; primary industrial equipment and processes, NAVSEA 070 and 075.

Subtask I-2, Concept Exploration and SIMA Feasibility - Determine the feasible CC systems and measures that can be delivered and/or supported by SIMA (SD). Evaluate and list the significant characteristics for those CC systems and measures that can be delivered by SIMA (SD). Develop SIMA (SD) delivery concepts. For example, (1) the normal industrial plant equipment (IPE) and facililty modernization program for "CC Shop", and (2) a modular and portable containerized unit as 8 ft. x 8 ft. x 20 ft. metal containers for production services like flame-spray, sintered, and electrostatic-spray coatings. Identify and list applicable CC information and personnel knoweldge and skills for planning, production, QA and configuration management. Develop ranking schemes and rank. Develop draft recommendations for inclusion in the "SIMA (SD) IPE and Facility Master Plan."

Subtask I-3, Phase I In-Process Review (Pilot CC Shop Processes and Equipment Selection) - Conduct In-Process Review (IPR) of Subtasks I-1 and I-2 with SIMA (SD), CNSP N81 and NOSC COTR/representative.

Note: CC coating processes and application equipment recommendations and selection will be made for the SIMA Pilot CC Shop.

Subtask I-4, SIMA (SD) Corrosion-Control (CC) Shop Master Plan and Pilot CC Shop Service Test Plan Concept - Finalize recommendations for SIMA (SD) Corrosion-Control Shop Master Plan to include the Pilot SIMA (SD) CC Shop. This subtask will incorporate all the recommendations developed in the IPR and will be the "Phase I" Final Letter Report.

1.4.3 PHASE II - SIMA (SD) Pilot CC Shop and Service Test Plan

Phase II has seven subtasks:

Subtask II-1, Physical System Design - Develop and design the required physical system specified in Phase I, Subtask 4. Include equipment, safety, environmental and logistics requirements, facility arrangement and location. Recommend initial equipment procurements, facility and utility services.

Subtask II-2, Industrial Process Instructions - Develop industrial process instructions for the selected corrosion-control systems. Coordinate with NAVSEA 070 and 075 for the current guidance on content, format, QA, safety, environmental controls and validation/verification of the process instructions. Develop SIMA process instructions accordingly. Validate ("paper check") all process instructions with SIMA (SD) Production Engineer (Code 3800) and verify (hardware/software operations check by performing production and QA personnel) all process instructions where the physical system is installed and is operational.

Subtask II-3, Quality Assurance - Develop a QA program for the CC services to be delivered and/or supported by Pilot CC Shop. Ensure compatibility and implementability by the SIMA (SD) organization.

Subtask II-4, Navy Safety, EPA and OSHA Summary - Summarize all the Navy Safety, Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) requirements and actions taken to satisfy them in the pilot program. Coordinate findings and actions with EPMU-5, as required.

Subtask II-5, Final System Design and Service Test Plan - Develop the final design of the SIMA (SD) CC Shop. Develop the Service Test Program to include data collection, analysis and reporting. Develop update recommendations for the SIMA (SD) Industrial Plant Equipment (IPE) and Facility Master Plan as appropriate. Complete the initiation of all procurement actions for the Service Test Program. Coordinate all equipment selection/procurements with SIMA (SD).

Subtask II-6, Phase II In-Process Review (IPR) - Conduct IPR with SIMA (SD), CNSP (N81) and NOSC. IPR should be scheduled to be held two (2) weeks after receipt of the draft final report by action attendees.

Subtask II-7, Final Report (Phases I and II) - Develop the final design of the SIMA (SD) CC Shop. Develop the Service Test Plan to include data collection, analysis and reporting. Develop update recommendations for the SIMA (SD) IPE and Facility Master Plan as appropriate. Complete the initiation of all procurement actions for the Service Test Program. Coordinate all equipment selection/procurements with SIMA (SD).

1.5 PLAN OF THE REPORT

Section 1 is the introduction presenting the background, objective, scope and approach, including a study methodology logic chart and schedule.

Section 2 through 9 presents the literature review, analyses and recommendations for the SIMA (SD) Pilot CC Shop, the SIMA (SD) Master Plan and Basic Facilities Requirements document, and a proposed SIMA Process Instruction for applying the wire-sprayed aluminum (WSA) coating system.

Sections 10 and 11 present the final SIMA (SD) Pilot CC Shop System Design and the Service Test Plan. These last two sections incorporate all the recommendations made and actions taken by CNSP (N81) and SIMA (XO) during the conduct of the study for the Phase III Service Test.

SECTION 2

LITERATURE REVIEW & SELECTION MATRICES (Subtask I-1)

2.1 LITERATURE REVIEW

In conducting the critical literature review of the corrosion control coating systems that would be feasible for SIMA applications, it was determined that the following NAVSEA publications are the major authoritative references:

- Naval Ships Technical Manual, NAVSEA S9086-VD-STM-000/CH-631, Preservation of Ships in Service (Surface Preparation and Painting) (Ref. 5);
- MIL-STD-2138(SH), Metal Sprayed Coating Systems for Corrosion Protection Aboard Naval Ships (Ref. 6);
- NAVSEA Ship Class Corrosion-Control Manuals for the FFG-7, DD-963, AO-177, LHA- 1, FF-1052, LST-1179 and CG-16 Classes (Refs. 7-13); and

In addition, 49 other documents were collected and reviewed. The bibliography lists these documents. Visits were made and data collected from Navy and commercial activities where these CC systems are operational and/or being evaluated. Discussions have been held with engineers/scientists/technicians in the following subject areas: CC coating systems, facilities, requisite application equipment, and processes regarding potential problem areas, technology transfer and practicality. Of particular significance were the visits to Puget Sound Naval Shipyard, the lead yard for thermal-spray technology and the only West Coast NSY with a powder electrostatically spray coating production capability, and to the following East Coast activities:

COMNAVSURFLANT, Code N421, N423E
COMNAVAIRLANT, Code 511B
Readiness Support Group, Norfolk, CO
Norfolk NSY, Code 134.4, 133.13
Philadelphia NSY, Code 380

NAVSSES, Code 053B
SIMA (Phil), CO
COMNAVSEASYSCOM, SEA 05M, 05M1, 05R25, 0704,
075, 91AD121, 913
DTNSRDC, Code 28, 2803M

Reference 14 details the discussions and information collected.

Figure 2-1 lists the 15 CC systems from the Ship Class Corrosion Control Manuals (Refs. 7-13). In addition to the CC coating systems cited in Figure 2-1, the documents reviewed detail the requirements for surface preparation, industrial equipment, applications, quality assurance and safety.

2.2 MATRICES OF AUTHORIZED CC PROCESSES AND THEIR SUITABILITY FOR SIMA EMPLOYMENT

To evaluate SIMA (SD's) capability to deliver each of the 15 prescribed coating systems, each system was viewed individually and analyzed against SIMA's current capability. In addition, each system was reviewed for compliance using functional requirements that must be met prior to that system becoming a viable production process. These functional requirements are:

- Technology developed;
- Industrial Plant Equipment (IPE) developed;
- Process authorized by NAVSEA;
- Process instruction developed/approved
  - IPE (specific equipment)
  - Method (how to)
  - Quality assurance
  - Safety
  - Training/certification;

SYSTEM #	COATING SYSTEM
1	Wire Sprayed Aluminum with Heat Resisting High Temperature Sealer (Silicone Alkyd Aluminum Sealer)
2	Wire Sprayed Aluminum with Low Temperature Sealer (Strontium Chromate) (Epoxy Polyamide or Silicone Alkyd Topcoat)
3	Topcoat - C1 through S4
4	Powdered Coatings; Fluidized Bed or Electrostatically Applied (MIL-R-46896)
5	Non-Skid Deck Coating
6	Ceramic Coatings (MIL-C-81751)
7	Water Displacing Clear Corrosion Preventive Compound (MIL-C-85054)
8	Antiseize Thread Compound (MIL-T-22361)
9	Improved Fasteners
10	Sealing and Coating Compound (MIL-S-81733, Type I)
11	Polysulfide Sealant (MIL-S-81733, Type IV)
12	Protection of Multi-pin Connectors
13	Plastic Dielectric Barrier (ABS)
14	Vapor Phase Inhibitor (MIL-I-22110)
15	Strippable Coatings (MIL-S-8802)

FIGURE 2-1. CORROSION PREVENTION SYSTEMS

- CC information for the SIMA Information Maintenance Management System (IMMS) available; and
- Availability of manning and establishment of lead rating for supervision.

The matrices (Fig. 2-2 A, B and C) provides an evaluation against each of the 15 systems with regard to these requirements. The matrices also indicate that the SIMA Corrosion Control Shop would have three types of service it could offer. They are: Ship-to-Shop, Open Shop and Shipboard. In the case of Ship-to-Shop, SIMA would perform all activities. In the Open Shop, SIMA would perform training and supervision functions, and for Shipboard services, SIMA could perform training, supervision and provide the industrial portable/modular equipment or perform the work itself.

The designators for answering the selection criteria are a "Yes", "No" or "Partial." The answer "Yes" indicates the criteria is presently satisfied; "No" indicates the critieria is not presently satisfied; and "Partial" means that some capability exists to satisfy the functional requirement.

The following example is provided to illustrate the information contained in each matrix: Topcoats - System 3. When this system is compared to the functional requirements, it meets three of the six. That is, the technology for the system is developed, there is industrial equipment available for application of the system and the process authority (NAVSEA) has been issued. However, this system cannot be presently used by SIMA because there does not exist sufficient CC information for planning and control within SIMA's Intermediate Maintenance Management System (IMMS), nor is there available manning to perform the work. Most importantly, there is no process instruction which contains SIMA specific equipment, methodology, quality control (in-process and end-item inspection), safety and operator training and/or certification.

CORROSION CONTROL SHOP

LEAD SHOP FOR SHIP WORK (1)

SHIP-TO-SHOP

CORROSION-CONTROL SYSTEM

	1 WSA High Temp.	2 WSA Low Temp.	3 Exterior Topside Coating	4 Powder Coatings	5 Non-Skid Deck Coatings	6 Ceramic Coating (2)	7 Water Displacing Compounds	8 Anti-Seize Compounds	9 Improved Fasteners	10 Seal & Coating Compounds	11 Polysulfide Sealants	12 Multi-Pin Conn. Prot.	13 Plastic Dielectric Barrier	14 Vapor Phase Inhibitor	15 Strippable Coating
Technology Developed	+	+	+	+	+	0	+	+	+	+	+	+	+	+	+
Industrial Equipment Developed	+	+	+	+	+	0	+	+	NA	+	+	+	+	+	+
Process Authority	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Process Instruction															
• IPE	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
• Method	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
• QA	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
• Safety	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
• Training/ Certification	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
Corrosion Control Information For IMMS	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
Manning															
• Lead Rate	-	-	-	-	-	-	-	-	NA	-	-	-	-	-	-

Legend:

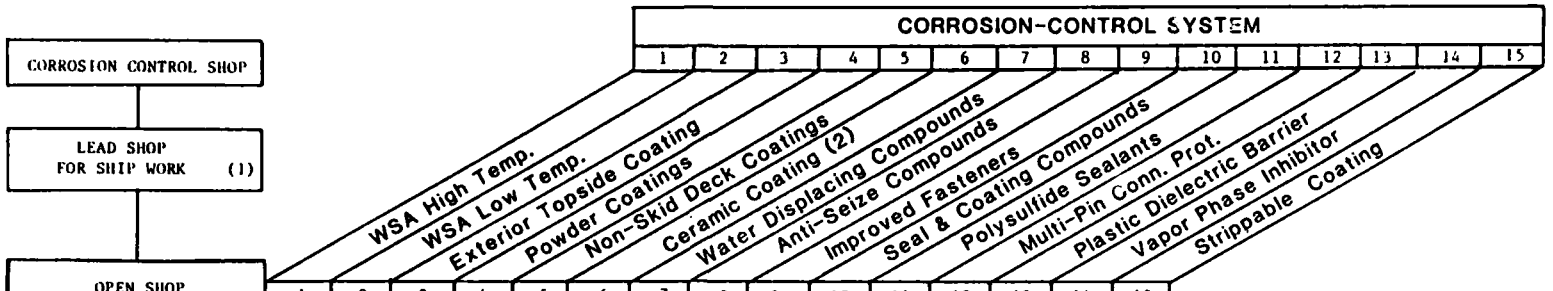
Production Capability	
YES	= +
NO	= -
PARTIAL	= 0

NOTES:

(1) The SIMA CCS would be designated the "Lead Shop" when a component/structure required Corrosion Prevention Treatment. (No repair/replacement)

(2) No automated processes available; currently under development PSNS.

FIGURE 2-2A MATRIX OF AUTHORIZED CC PROCESSES AND THEIR SUITABILITY (SHIP-TO-SHOP)



OPEN SHOP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Technology Developed	+	+	+	+	+	0	+	+	+	+	+	+	+	+	+
Industrial Equipment Developed	+	+	+	+	+	0	+	+	NA	+	+	+	+	+	+
Process Authority	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Process Instruction															
• IPE	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
• Method	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
• QA	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
• Safety	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
• Training/ Certification	0	0	-	-	-	-	-	-	NA	-	-	-	-	-	-
Corrosion Control Information For IMMS	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
Manning															
• Lead Rate	-	-	-	-	-	-	-	-	NA	-	-	-	-	-	-

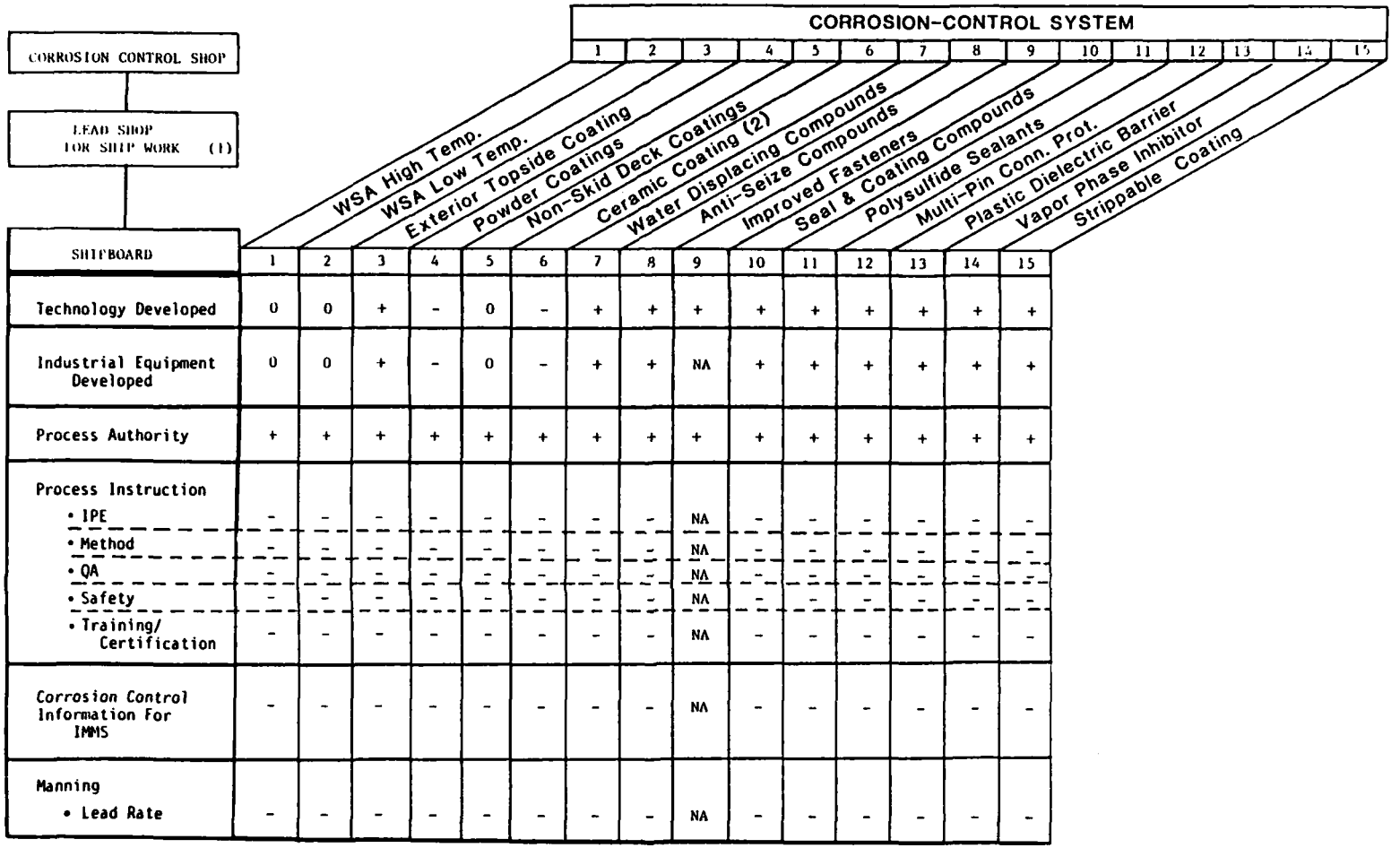
Legend: Production Capability

YES	= +
NO	= -
PARTIAL	= 0

NOTES: (1) The SIMA CCS would be designated the "Lead Shop" when a component/ structure required Corrosion Prevention Treatment (No repair/ replacement).

(2) No automated processes available; currently under development PSNS.

FIGURE 2-2B MATRIX OF AUTHORIZED CC PROCESSES AND THEIR SUITABILITY (OPEN SHOP)



Legend: Production Capability

YES	=	+
NO	=	-
PARTIAL	=	0

NOTES:

(1) The SIMA CSS would be designated the "Lead Shop" when a component/structure required Corrosion Prevention Treatment. (No repair/replacement)

(2) No automated processes available; currently under development PSNS.

FIGURE 2-2C MATRIX OF AUTHORIZED CC PROCESSES AND THEIR SUITABILITY (SHIPBOARD)

2.3 CC SYSTEMS FEASIBLE FOR SIMA (SD) DELIVERY

SIMA (SD) could presently implement 13 of 15 CC systems. This is based on the analysis of the functional requirements of the technology and the resources required for each system. Of the 15 corrosion control systems, the two CC systems that are not presently considered feasible for SIMA (SD) are: Ceramic Coatings (System 6), and Improved Fasteners (System 9).

Ceramic coatings presently are being applied only by licensed commercial sources using the hand-spray technique. This is not cost effective. A new fastener ceramic coating process is under evaluation, i.e. the "dip/spin process." Puget Sound Naval Shipyard (PSNS) (Shop 71) is evaluating this process for NAVSEA 05R25 and DTNSRDC 2803M. Until PSNS develops an approved industrial process for ceramic coating of fasteners which can be "down-sized" for SIMA, this process is not considered feasible.

The "improved fastener," System 9, consists of substituting corrosion-resistant fasteners for ferrous fasteners. Selection of the improved fasteners, usually a stainless steel or corrosion resistant steel (CRES), must be based on the operating environment, the materials to be fastened and the electrochemical characteristics of these materials. The determination can best be made at the organizational or shipboard level where the actual fastening requirements, operating environment and the dissimilar metals problems are known. Additionally, the supply action and accountability for procurement, changeout and configuration control can also be effectively accomplished by the ship. Accordingly, System 9 is not recommended for delivery by the SIMA CC Shop. Similarly, SIMA Lead Shops should develop and maintain their own inventory of improved fasteners to meet their specific repair/overhaul requirements. However, during the 27 April 1984 In-Process Review, Systems 6 and 9 were added for implementation (see para. 4.2.5). A minimal stocking of both System 6 and 9 fasteners will be accomplished and used to make up installation kits for those components preserved with CC Systems 1, 2 and 4.

It should be emphasized that training of personnel must be tailored to each specific coating system to be used. A thorough knowledge of why a particular coating system is being specified, where the coating system is to be

used, and when to use it is inherent in the success of any CC program. Only the wire sprayed aluminum (WSA) coating systems (Systems 1 and 2 of Figure 2-1) require operator certification per the DoD-STD-2138(SH) (Ref. 6).

In summary, based on the literature review, facilities visited and interviews conducted, SIMA (SD) could supply/deliver the majority of the specified corrosion control systems. The feasibility of this implementation in terms of facilities, manpower and monetary (budget cycle) considerations will be presented in Section 3.

SECTION 3

CONCEPT EXPLORATION AND SIMA FEASIBILITY
(Subtask I-2)

This section presents the SIMA delivery feasibility analysis of the 15 NAVSEA-designated CC Systems. The final designation and scope of the CC systems to be delivered by the SIMA (SD) Pilot CC Shop is based on the recommendations of this section and the In-Process Review (Section 4) and is presented in Section 10.

3.1 SIMA CORROSION-CONTROL (CC) SHOP FUNCTIONS

It is recommended that SIMA (SD) establish a CC shop as a separate SIMA Work Center to perform the functions specified in Figure 3-1. (Figure 3-1 summarizes the SIMA CC Shop functions for the 15 CC systems cited in Refs. 7-13).

FUNCTIONS	CORROSION-CONTROL SYSTEM 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	WSA High Temp.	WSA Low Temp.	Exterior Topside Coating	Powder Coatings	Non-Skid Deck Coatings	Ceramic Coating	Water Displacing Compounds	Anti-Seize Compounds	Improved Fasteners	Seal & Coating Compounds	Polysulfide Sealants	Multi-Pin Conn. Prot.	Plastic Dielectric Barrier	Vapor Phase Inhibitor	Strippable Coating
1 - LEAD SHOP FOR SHIPS*															
. Ship-to-Shop	X	X		X											
. Open Shop	X	X		X											
. Shipboard	X	X		X											
2 - ASSIST SHOP FOR SIMA*	X	X		X											
3 - TECH ASSIST**															
. Ships	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
. SIMA Shops	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4 - MATERIAL ISSUE															
. Ships							X	X		X	X	X	X	X	X
. SIMA Shops			X	X	X		X	X		X	X	X	X	X	X

* Provide full production services with Pre-Placed Contracts (CIS) for System 4

** Provide technical guidance/direction but no production services

FIGURE 3-1. SIMA CORROSION-CONTROL SHOP FUNCTIONS

A. Lead Shop - will provide tended ships with:

(1) Ship-to-Shop, Open Shop and Shipboard services for four CC systems (1, 2, 4 and 5).

(2) Technical advice to ships and SIMA shops for all CC systems.

(3) Material issue to SIMA and the ships for Systems 7, 8, 10, 11, 12, 13, 14 and 15, which require minor amounts of consumable material issue, such as water displacing compounds (Sys. 7) and polysulfide sealants (Sys. 11). The SIMA CC Shop should provide technical assistance on application procedures and "starter kits of consumables" until the SIMA Lead Shop and Ship's Supply Department can procure adequate stock of materials.

B. Assist Shop (to other SIMA Lead Shops for Shop-to-Shop work) to provide:

(1) CC services for Systems 1 (WSA high temperature), 2 (WSA low temperature) and 4 (powder coatings).

(2) Technical advice on all CC systems.

(3) Material issue of all CC coating system consumables for SIMA. **Note:** The CC Shop will advise other SIMA shops on System 9 (Improved Fasteners) but will not stock/issue improved fasteners for other SIMA shops.

3.2 FACILITY AND EQUIPMENT REQUIREMENTS AND ESTIMATED EQUIPMENT COSTS

In making the determination of how to best implement the Corrosion-Control Shop, consideration was given to the Planning, Programming and Budgeting (PPB) cycle for Industrial Plan Equipment (IPE) and Facilities vs. the acquisition of portable/containerized units. The critical issues addressed were: (1) fully engineered design (satisfies all functional, safety and environmental requirements); and (2) delivery schedule. To implement the Pilot CC Shop in the shortest possible time, which satisfies the two critical issues, it was decided to recommend the portable/containerized units. They are fully engineered for "turn-key" installation in current/programmed SIMA facilities, can be delivered

in approximately 60 to 90 days, and have a demonstrated track record established by current use by S/F personnel aboard Navy ships and in Naval shipyards.

The requirement for production, staging and coating-application working areas required for each of the 15 CC systems are provided in Figure 3-2. Production area, staging area (receipt inspection, storage, queuing and log-out), and the coating-application areas should be co-located for delivering CC Systems 1 and 2 (high- and low-temperature WSA).

CC SYSTEM	DESCRIPTION	PRODUCTION AREA	STAGING AREA	COATING-APPLICATION AREA
1	WSA (High Temp)	Yes	Yes	Yes
2	WSA (Low Temp)	Yes	Yes	Yes
3	Topcoats	No	No	Yes
4	Powdered Coating	Yes	Yes	No
5	Non-Skid	No	Yes	No
6	Ceramic Coating	N/A	N/A	N/A
7	Water Displ. Comps.	No	No	No
8	Anti-Sieze Comps.	No	No	Yes
9	Improved Fasteners	N/A	N/A	N/A
10	Seal & Coating Comps.	No	No	Yes
11	Polysulfide Sealants	No	No	Yes
12	Multi-Pin Conn. Prot.	No	No	No
13	Plastic Dielectric Bar.	No	No	No
14	Vapor Phase Inhibitor	No	No	No
15	Strippable Coating	No	No	Yes

FIGURE 3-2

PRODUCTION, STAGING AND COATING-APPLICATION AREA REQUIREMENTS

The major equipment components and their estimated costs to provide production services for the 15 CC systems are tabulated in Figure 3-3. The costs were obtained verbally from various manufacturers or their distributors.

CC SYSTEM	DESCRIPTION	MAJOR COMPONENTS	COST
1	WSA - High Temp	Combustion Gun	$ 4,500
		Air Dryer *	$ 1,500
		Air Cleaner *	$ 1,500
		Abrasive Blasting Booth *	$75,000
		Spray Booth *	$50,000
		Wire Feeder	$ 3,000
		Degrease Equipment *	$ 6,500
			$142,000
		Arc-Wire Gun	$ 3,000
		Electronic Wire Feed	$ 3,000
		Power Supply	$ 5,000
		Air Dryer *	$ 1,500
		Air Cleaner *	$ 1,500
		Abrasive Blasting Booth	$75,000
		Spray Booth *	$50,000
		Degrease Equipment *	$ 6,500
			$145,500
2	WSA - Low Temp	Same as System 1	
3	Exterior Topside Coatings	Abrasive Blasting Equip. **	$30,000
		Application Equipment **	$ 3,000
		Spray Booth **	$25,000
		Storage Locker **	
		Flammable Stowage	$15,000
		Hazardous Waste	$15,000
			$88,000
4	Powdered Coatings	Spray Gun	$ 1,000
		Power Supply	$ 6,000
		Resin Hoppers	$ 1,500
		Spray Booth	$30,000
		Oven	$25,000
			$63,500
5	Non-Skid Deck Coatings	Abrasive Blasting Equipment (Portable)	$ 6,000
6	Ceramic Coating	N/A	N/A
7	Water Displacing Comps.	Application Equipment	$ 2,000
8	Anti-Sieze Compounds	N/A ***	$15,000
9	Improved Fasteners	N/A ***	N/A
10	Seal & Coating Compounds	Abrasive Blasting Equip. **	$30,000
		Dip Tank	$ 3,000
			$33,000
11	Polysulfide Sealants	Abrasive Blasting Equip. **	$30,000
		Application Equipment **	$ 3,000
			$33,000
12	Multi-Pin Conn. Prot.	N/A ***	$ 5,000
13	Plastic Dielectric Barrier	N/A ***	$ 5,000
14	Vapor Phase Inhibitor	N/A ***	$10,000
15	Strippable Coating	N/A ***	$15,000

* Common to CC Systems 1 & 2

** Common to CC Systems 3, 10 & 11

*** Rotable Pool Items - CC Systems 7, 8, 12, 13, 14, 15

FIGURE 3-3. ESTIMATED EQUIPMENT COSTS FOR EACH OF THE 15 CC SYSTEMS

Many of the CC systems have common equipment requirements. For example, CC Systems 1 and 2 (high- and low-temperature WSA) will use the same staging and production work areas and equipments. The only difference is in application of a high-temperature paint sealer for CC System 1 vice a low-temperature paint sealer and a topcoat for System 2.

3.3 SIMA (SD) FEASIBILITY ESTIMATE

The feasibility of SIMA (SD) to deliver the 15 NAVSEA CC Systems specified in the Ship Class CC Manuals (Refs. 7-13) is based on the ranking algorithm provided in Figure 3-4. This was based on the critical literature review performed and the analysis of the matrices presented in Section 2.

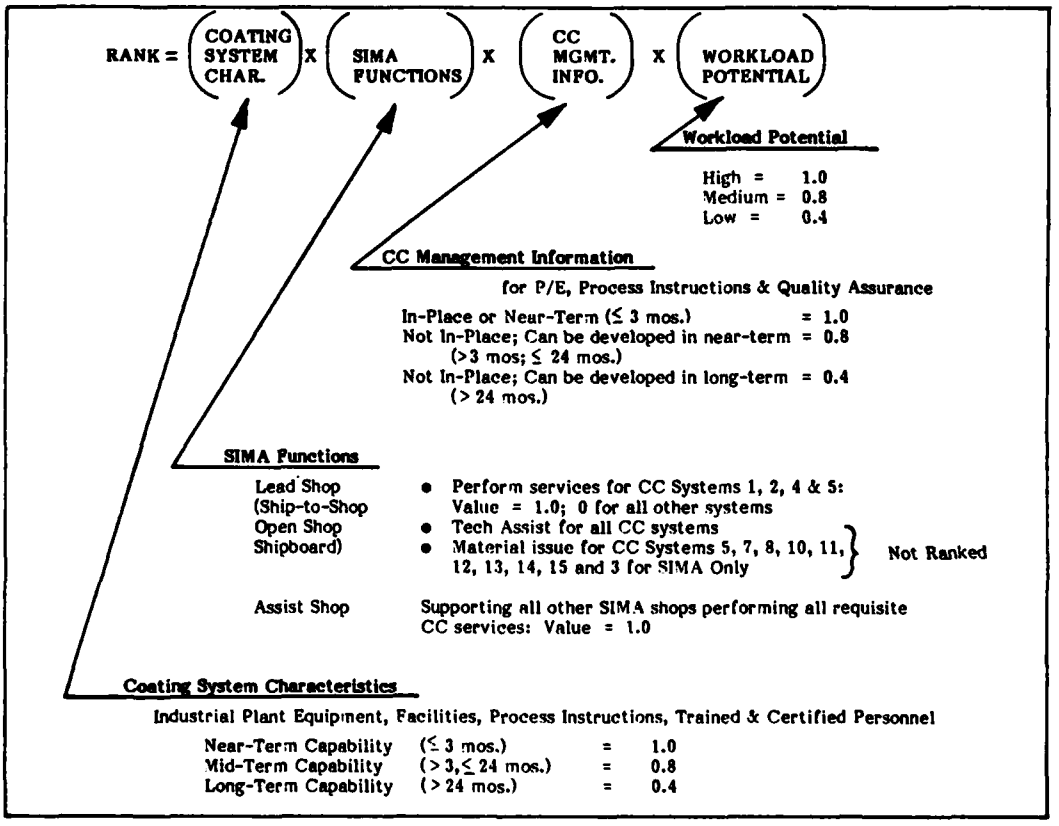


FIGURE 3-4. SIMA FEASIBILITY RANKING ALGORITHM

3.4 CC SYSTEM RANKING FOR SIMA (SD) IMPLEMENTATION

Figure 3-5 provides the estimated parameter values, the total value derived from the ranking algorithm (Figure 3-4), and the ranking for each of the 15 CC systems.

RANKING PARAMETER		CORROSION-CONTROL SYSTEM 1 WSA High Temp.	2 WSA Low Temp.	3 Exterior Topside Coating	4 Powder Coatings	5 Non-Skid Deck Coatings	6 Ceramic Coating	7 Water Displacing Compounds	8 Anti-Seize Compounds	9 Improved Fasteners	10 Seal & Coating Compounds	11 Polysulfide Sealants	12 Multi-Pin Conn. Prot.	13 Plastic Dielectric Barrier	14 Vapor Phase Inhibitor	15 Strippable Coating
COATING SYSTEM CHARACTERISTICS (IPE, FAC, PI, Pers)		1	1	1	0.8	0.8	0	1	1	0	1	1	1	1	1	1
SIMA FUNCTIONS (Lead Shop / Assist Shop)		1	1	0 / 1	0	0 / 1	0 / 1	0 / 1	0 / 1	0	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1
CC MGMT. INFORMATION (P/E, PI, QA)		0.8	0.8	0.8	0.8	0.8	0	1	1	0	1	1	1	1	1	1
WORKLOAD POTENTIAL		1	1	0 / 0.4	0.4	1	0	0.4	0.8	0	0.4	0.4	0.4	0.4	0.4	0.4
TOTAL VALUE (Lead Shop / Assist Shop)		0.8	0.8	0 / .32	.25	.64 / 0	0	0 / .4	0 / .8		0 / .4	0 / .4	0 / .4	0 / .4	0 / .4	0 / .4
RANKING	Lead Shop	1	1	0	3	2	0	0	0	0	0	0	0	0	0	0
	Assist Shop	1	1	3	4	0	0	2	1	0	2	2	2	2	2	2

FIGURE 3-5.
PARAMETER VALUES FOR RANKING ALGORITHM

Figure 3-6 is the ranking summary for the service applications when the CC shop is utilized as either Lead Shop or Assist Shop.

LEAD SHOP FOR	SERVICE APPLICATION RANKING	TECHNICAL ADVICE	MATERIAL ISSUE
• Ship-to-Shop • Open Shop • Shipboard	1st - Sys. 1 & 2 2nd - Sys. 5 3rd - Sys. 4*	All Systems	Sys. 7, 8, 10, 11, 12, 13, 14 & 15
ASSIST SHOP FOR SIMA WORK (Shop-to-Shop)	1st - Sys. 1, 2 & 8 2nd - Sys. 7 3rd - Sys. 3 4th - Sys. 5 5th - All Others except 6	All Systems	Sys. 3, 4, 5, 7, 8, 10, 11, 12, 13, 14 & 15

* SIMA should use Pre-Placed Contract services until production character and volume are determined.

FIGURE 3-6. RANKING SUMMARY

3.5 SIMA (SD) DELIVERY CONCEPTS

Three CC shop configuration/manning concepts, based primarily on equipment acquisition costs, have been considered for implementation: large, medium and small (see Figure 3-7). The large CC shop will be able to deliver all CC services to tended ships and other SIMA shops simultaneously. The medium and small CC shop will deliver the CC services as specified in Figure 3-7. The reduction in capacity is based primarily on the number of portable WSA units procured.

Function and Delivery Modes	CC Shop Size		
	Large	Medium	Small
Lead Shop • Ship-To-Shop	X	X	X*
• Open Shop	X		
• Shipboard	X	X	X
SIMA Assist Shop	X	X	

* Initial operation for training and evaluation followed by shipboard evaluation

FIGURE 3-7. CC SHOP SIZE ALTERNATIVES

The major characteristics and the estimated manning requirements are presented in Figure 3-8 for the large, medium and small CC shop. The large CC shop is based on four portable WSA units - one for the SIMA work and three deployed on the waterfront dedicated to ship support.

In addition to these units, CC System 4 (Powdered Coatings) could be provided. This coating system possesses a unique CC capability. Components which have difficult geometry, such as vent screens or hauser covers (expanded metal), can be efficiently coated with this system. These highly visible type components, although not large in number, are a high corrosion-prone maintenance item. The initial equipment cost for this system is relatively high ($90K). It is recommended that SIMA deliver powdered coatings through Pre-Placed Contracts services from a qualified local source until production volume has been established and analyzed as being cost effective to purchase the powder coating equipments.

LARGE	MEDIUM	SMALL
A. WSA - System 1 & 2 Shipboard, Open Shop, Ship-to-Shop, Assist Shop	A. WSA - System 1 & 2 Shipboard - Open Shop	A. Wire Sprayed Aluminum Low-Temperature, System 2, Shipboard
B. Electrostatically Sprayed Powdered Coatings (Sys. 4)	B. Electrostatically Sprayed Powdered Coatings (Sys. 4)	B. Electrostatically Sprayed Powdered Coatings (Sys. 4)
C. Technical Assistance For All Other CC Systems	C. Technical Assistance For All Other CC Systems	C. Technical Assistance For All Other CC Systems
D. Material Issue - All Coating Systems Equipment - All Coating Systems	D. Material Issue For Topical Coatings	D. Material Issue For Topical Coatings
M. Manning = 19	M = 13	M = 6
Equipment Cost Estimate: Lease: $593K /yr Purchase: $843K	Cost Estimate: Lease: $408K /yr Purchase: $535K	Cost Estimate: Lease: $152K /yr Purchase: Arc Wire System + Container = $230K
4 WSA Sys. 1 Powder Spray	2 WSA Sys. 1 Powder Spray	1 WSA Sys.

Major IPE

FIGURE 3-8. LARGE/MEDIUM/SMALL CC SHOP CHARACTERISTICS

The medium CC shop would contain two portable WSA units which could be located in Buildings 20 and 149 adjacent to Pier 4, where ships berth for the longer availabilities. This shop would satisfy the ship-to-shop and shipboard application requirements.

The small CC shop would contain one portable WSA unit and could be located in Buildings 20 or adjacent to Building 125. The small shop, for the service test, will be directed to testing and demonstrating SIMA's capability and capacity to provide services. Accordingly, the small shop will first operate in the ship-to-shop mode to shakedown the organization and operating procedures (including ship work scheduling and accomplishment) prior to shifting to delivering WSA CC services onboard ships.

Figure 3-9 shows the recommended locations for the four portable WSA units.

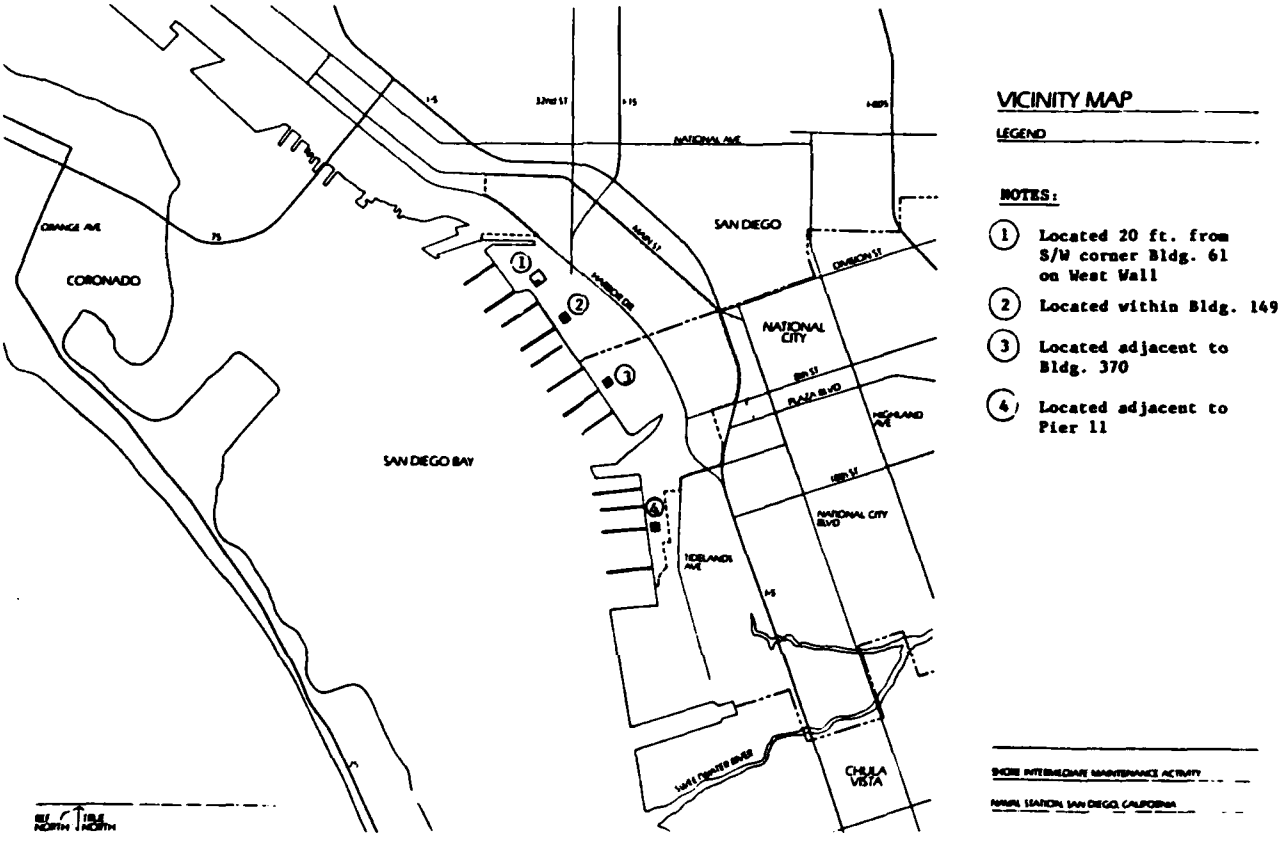


FIGURE 3-9. PROPOSED LOCATIONS FOR PORTABLE WSA UNITS (FULL CAPABILITY)

3.6 CC Knowldege and Skills Requirements

To properly plan the introduction of corrosion-control work into the SIMA production system, certain knowledge and skills are required by the personnel involved. The information required for the development of these skills is contained in the Ship Class CC Manuals, Engineering Drawings, Ship Class

Maintenance Plans (CMP), and Equipment Technical Manuals. Additional information is contained in NAVSEA and NSTM technical documents and DoD and Military Standards and Specifications. Figure 3-10 tabulates the preliminary estimate of CC knowledge and skill requirements (and primary source documents) for planning/estimating (P/E), production, quality assurance (QA) and configuration management personnel. SIMA personnel involved with CC services must be proficient in the foregoing functional areas.

Functional Area	Knowledge and Skills					
	Coating System Characteristics		Industrial Processes			
	General (1)	Specific (2)	Equip.	Procedure	QC	Safety OSHA
P/E	X	X		X	X	X
Production	X	X	X	X	X	X
QA	X	X		X	X	X
Conf. Mgmt.	X					

(1) Ship Class CC Manuals, Eng. Dwgs., CMPs and Equipment TMs

(2) NSTM, NAVSEA Technical Pubs., and DoD/MIL-Specs and Stds.

FIGURE 3-10. CC KNOWLEDGE AND SKILL REQUIREMENTS

3.7 PRELIMINARY INTERFACE WITH IMMS-RT

The Intermediate Maintenance Management System - Real-Time (IMMS-RT) is being developed and installed in the IMAs for maintenance planning, administration, accomplishment and reporting (Ref. 15). The "CC Technical Information" for the planning, production and quality assurance for

Maintenance Plans (CMP), and Equipment Technical Manuals. Additional information is contained in NAVSEA and NSTM technical documents and DoD and Military Standards and Specifications. Figure 3-10 tabulates the preliminary estimate of CC knowledge and skill requirements (and primary source documents) for planning/estimating (P/E), production, quality assurance (QA) and configuration management personnel. SIMA personnel involved with CC services must be proficient in the foregoing functional areas.

Functional Area	Knowledge and Skills					
	Coating System Characteristics		Industrial Processes			
	General (1)	Specific (2)	Equip.	Procedure	QC	Safety OSHA
P/E	X	X		X	X	X
Production	X	X	X	X	X	X
QA	X	X		X	X	X
Conf. Mgmt.	X					

(1) Ship Class CC Manuals, Eng. Dwgs., CMPs and Equipment TMs

(2) NSTM, NAVSEA Technical Pubs., and DoD/MIL-Specs and Stds.

FIGURE 3-10. CC KNOWLEDGE AND SKILL REQUIREMENTS

3.7 PRELIMINARY INTERFACE WITH IMMS-RT

The Intermediate Maintenance Management System - Real-Time (IMMS-RT) is being developed and installed in the IMAs for maintenance planning, administration, accomplishment and reporting (Ref. 15). The "CC Technical Information" for the planning, production and quality assurance for

the SIMA CC Shop is overlayed on the IMMS-RT System Data Flow Chart, Figure 3-11, to illustrate the "mainstream" of the ship's maintenance request to accomplishment of the job. Ideally, the CC applications information should be "inputted" into reference engineering drawings, information tables, technical library sources, PERA guidance/directives, and class maintenance and configuration publications to provide the initial authority and implementation guidance. Such information should then be used to develop the ship's CC work package using the Ship's Maintenance Action Form (2-kilo) (OPNAV 4790/2K). The ship's Current Ship Maintenance Program (CSMP) will then contain all the deferred CC jobs compiled as Automated Work Requests (AWR). The ship's AWRs will be screened for each availability and the CC AWRs, in turn, screened to the SIMA CC Shop. The CC Shop will then be routinely tasked and audited by IMMS-RT for planning and production control. During Phase III, CC Shop data elements would be developed for "managing the CC work" within the SIMA (SD) IMMS-RT System.

Figure 3-11 is Figure 2-3 of Ref. 15, with the recommended CC inputs overlayed.

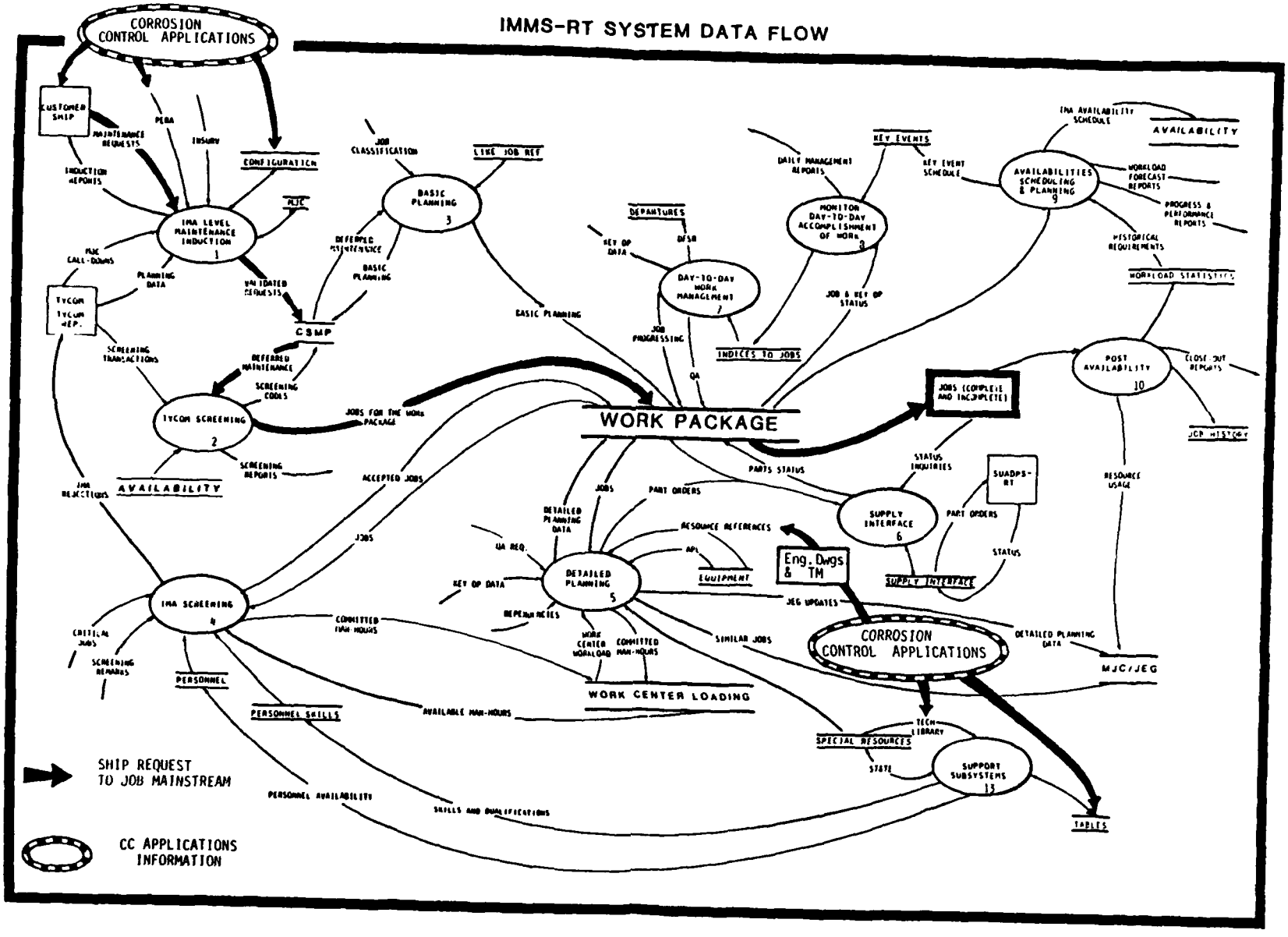


FIGURE 3-11 CC APPLICATIONS INFORMATION OVERLAYED ON THE IMMS-RT SYSTEM DATA FLOW

SECTION 4

IN-PROCESS REVIEW OF 27 APRIL 1984

4.1 GENERAL

An In-Process Review (IPR) was conducted 1000 - 1145 April 27, 1984 at SIMA (SD) to present the findings of the "Literature Review," Subtask I-1 and "Concept Formation and SIMA Feasibility," Subtask I-2.

Capt. P. Malone, Executive Officer of SIMA (SD) opened the meeting by stressing the importance of the Pilot Corrosion-Control Program for SIMA (SD) and certain problems related to its implementation, such as availability of personnel, equipment, training and technical assistance. Mr. R. Sulit (ISA) briefed the ISA task progress to date. Three alternatives were presented for the SIMA Pilot CC Shop.

This section summarizes the "formal" comments made during the IPR with all attendees present and the "informal" comments made individually by a participant immediately after the formal IPR session was conducted. A summary of the discussion and recommendations made follow each comment.

4.2 FORMAL COMMENTS, DISCUSSION AND RECOMMENDATIONS

4.2.1 Item: Modular CC Production Systems

A. Comment: The SIMA CC Shop should maximize the use of industrial plant equipment (IPE) which is portable, modular and self-contained for delivering each of the various CC systems.

B. Discussion: Use of self-contained, engineered systems for delivering each or combinations of the 15 CC systems is beneficial from several aspects.

- It will minimize the Military Construction (MILCON) impact if the modules can be installed easily into existing or programmed facilities.
- It will minimize the IPE impact by obtaining a fully engineered delivery system with demonstrated productivity meeting all OSHA and EPA requirements vice procurement of a design concept.

- It will minimize the training and logistic suppport requirements.

C. **Decision:** Use portable and self-contained CC delivery systems where cost effective.

4.2.2 **Item:** Material Issue for Selected CC Systems

A. **Comment:** SIMA (SD) provide material issue for CC Systems 7, 8 and 10 through 15 for Shipboard and Assist Shop-to-Shop usage.

B. **Discussion:** SIMA (SD) prefers that Naval Supply Center, San Diego initiate the stocking of these topical coatings for ship's use through their "SERVMART System" in lieu of SIMA duplicating this NAVSUP function. It was recognized that some CC applications are critically dependent upon proper installation or fastening of a preserved component (such as a powder coated and/or wire sprayed aluminum screen) installed in a paint-preserved housing. A system must be developed that is simple and responsive to the customer ships' needs and availability schedules.

C. **Recommendation:** None (see para. 4.3).

4.2.3 **Item:** Technical Assistance for SIMA CC Shop

A. **Comment:** Technical assistance for SIMA is needed whenever introduction of a new technology or new production capability occurs. This is especially so when the subject matter and personnel training/certification are not yet institutionalized.

B. **Discussion:** SIMA stated that contractor technical assistance for one year during the conduct of the SIMA Pilot CC Shop Service Test and final installation of the SIMA CC Services Program must be available. Adequate technical assistance is an important element to the successful implementation of a new technology into SIMA. SIMA should have a staff expert who is completely familiar with the CC systems and who can identify the correct applications for shipboard components and

areas. CDR J. Schuhl (CNSP N81) indicated that he would draft a Statement of Work to include continued ISA support for this SIMA CC project.

C. **Decision:** CNSP (N81) will develop a SOW for requisite material and technical support.

4.2.4 **Item:** Intermediate Maintenance Management System - Real-Time (IMMS) - RT.

A. **Comment:** Introduction of a work request from the customer ship into the IMMS-RT takes a varied flow path (Figure 3-11). This process may be too complex for effective induction and management of high-volume, low-priority work.

B. **Discussion:** An alternative to the formal induction of work through the IMMS-RT System may be to establish a "walk-in shop" wherein the Work Request (2 kilo) contains the CC maintenance requirements for a class of components, the appropriate number of items to be serviced and the availability schedules, e.g., 20 vent screens and 15 stanchions, 8-20 APR 84. This would allow high-volume, low-priority items to be completed in a timely manner.

C. **Decision:** SIMA will develop the appropriate planning and production mechanism compatible with IMMS-RT.

4.2.5 **Item:** Alternative A (Large CC Shop), Alternative B (Medium CC Shop), Alternative C (Small CC Shop) (Figure 4-1).

A. **Comment:** A decision is required on the scope of resource requirements and technical assistance in order to proceed with development of the Master Plan, Subtask I-4.

B. **Discussion:** SIMA's current mission does not include delivery of CC services. Accordingly, their charter must be expanded to indicate the scope of services and resources that must be allocated so that SIMA can, in fact, deliver the "chartered services". SIMA (SD) has no current resources for CC capital

ALTERNATIVE A (LARGE CC SHOP)

CAPABILITY	RESOURCE RQMTS ($K) MAJOR EQUIPMENTS BUY	RESOURCE RQMTS ($K) MAJOR EQUIPMENTS LEASE/BUY*	RESOURCE RQMTS ($K) TECH SUP	ALTERNATIVE
• TECH ASSIST FOR 15 CC SYSTEMS			314	A_1 (BUY) = 1157
• PRODUCTION CAPABILITY FOR SYSTEMS 1,2,4 & 5:				
• 4 WSA UNITS	625	375		A_2 (LEASE) = 907
• 1 POWDER COATING UNIT	100 - - - -	- - → 100		
• 6 SMALL WHEELABRATORS	66 - - - -	- - → 66		
• TOPICAL COATING INVENTORY	52 - - - -	- - → 52		
	843	593	314	

ALTERNATIVE B (MEDIUM CC SHOP)

CAPABILITY	RESOURCE RQMTS ($K) MAJOR EQUIPMENTS BUY	RESOURCE RQMTS ($K) MAJOR EQUIPMENTS LEASE/BUY*	RESOURCE RQMTS ($K) TECH SUP	ALTERNATIVE
• TECH ASSIST FOR 15 CC SYSTEMS			255	B_1 (BUY) = 790
• PRODUCTION CAPABILITY FOR SYSTEMS 1, 2, 4 & 5:				
• 2 WSA UNITS	317	190		B_2 (LEASE) = 663
• 1 POWDER COATING UNIT	100 - - - -	- - → 100		
• 6 SMALL WHEELABRATORS	66 - - - -	- - → 66		
• TOPICAL COATING INVENTORY	52 - - - -	- - → 52		
	535	408	255	

ALTERNATIVE C (SMALL CC SHOP)

CAPABILITY	RESOURCE RQMTS ($K) MAJOR EQUIPMENTS BUY	RESOURCE RQMTS ($K) MAJOR EQUIPMENTS LEASE/BUY*	RESOURCE RQMTS ($K) TECH SUP	ALTERNATIVE
• TECH ASSIST FOR 15 CC SYSTEMS			255	C_1 (BUY) = 485
• PRODUCTION CAPABILITY FOR SYSTEMS 1 & 2:				
• 1 WSA UNIT	193.5	116.1		C_2 (LEASE) = 407
• ARC WIRE SYSTEM	11.0	11.0		
• POWDER COATING	25.0	25.0		
	229.5	152.1	255	

* 1-YEAR LEASE PLAN WITH BUY-OUT ESTIMATED AT 40% OF PURCHASE PRICE

FIGURE 4-1. CAPABILITIES AND RESOURCE REQUIREMENTS FOR THE LARGE/MEDIUM/SMALL CC SHOP ALTERNATIVES

equipment. Funding for a CC Shop program would have to come from COMNAVSURFPAC or COMNAVSEASYSCOM. SIMA (SD) will support the Pilot CC Shop Service Test with manpower and facilities but needs command authorization for personnel, facilities and/or IPE and resources to proceed beyond the Service Test.

SIMA XO concurs with sizing the Pilot CC Shop Service Test to Alternative C, Small CC Shop. However, SIMA does not consider that a 3-month service test period is adequate. A minimum of one-year operation is necessary to evaluate realistically the service delivery capability. SIMA (SD) requested one year technical assistance for implementing the Pilot CC Shop.

CNSP N81 concurred that the SIMA (SD) Pilot CC Shop Service Test should be sized to Alternative C, Small CC Shop (production capability for CC Systems 1 & 2 (WSA low and high temperature), Pre-Placed Contract Services for CC System 4 (powder coatings), Tech Advice for all CC Systems and Material Issue for CC Systems 6 through 15), and that the service test period should be one year.

Note: The actual scope and schedule of the Pilot CC Shop Service Test, however, will be determined by resources allocated.

C. Decision:

(1) SIMA's current mission allows for "programs to improve methods of maintenance and repair and develop new repair techniques for modern military ship systems." Accordingly, the Pilot CC Shop could be implemented under this mission statement. However, the SIMA mission and their facility and IPE authorization must be modified after the Pilot Program.

(2) Size the Pilot CC Shop Service Test to Alternative C, Small CC Shop:

- Production capability for ship-to-shop and shipboard delivery of wire sprayed aluminum (WSA) (CC Systems 1 & 2) with one portable containerized flame-spray system.
- Pre-Placed contract support for powder coatings (CC System 4).
- Tech advice for 15 CC Systems.
- Material issue for CC Systems 6 through 15.

(3) Operate the Pilot CC Shop Service Test for 1 year and provide ISA technical support for the 1-year test period.

(4) SIMA (SD) will support the development of a new Work Center for corrosion-control (CC) services.

- SIMA will provide six personnel for the Pilot CC Shop.
- SIMA will designate and allocate staging and work areas for the Pilot CC Shop.
- SIMA will establish the Pilot CC Shop as a separate Work Center.
- SIMA 3800 (Production Engineering) is the Lead SIMA Code for the development and operation of the CC Shop.

4.3 INFORMAL COMMENTS:

Item: Material Issued by SIMA for Selected CC System

Comment: In addition to having Naval Supply Center, San Diego initiate the stocking of certain CC System, i.e., topical coatings and improved fasteners, this function should remain within SIMA (SD). This would ensure that Ship's Force would receive the correct corrosion-compatible materials and installation and maintenance instructions. Shipboard installation will be seriously degraded if Ship's Force must go to two places, i.e., to SIMA for the CC services and to SERVMART for the topical coatings and/or fasteners.

SECTION 5

PILOT CC SHOP SERVICE TEST PLAN CONCEPT
AND
RECOMMENDATIONS FOR THE SIMA FACILITIES MASTER PLAN
(Subtask I-4)

5.1 GENERAL

The scope of work in Subtask I-4 concentrated on developing the Small CC Shop alternative selected in the 27 APR 84 IPR for the SIMA (SD) Pilot CC Shop. The approach used was, working with SIMA Production Engineering and the SIMA Civil Engineer, to develop alternate Pilot CC Shop configurations. It was recommended that the scope of the Pilot CC Shop alternatives include using the existing SIMA facilities and IPE augmented with additional IPE (from the resources of this delivery order) to provide an industrially engineered work center to provide ship-to-shop and shop-to-shop services. It is noted that the major objective of the SIMA CC Program is to develop a CC service capability that can be easily installed in other SIMAs. The development and testing of portable/containerized, turn-key modules is a necessary element of the Service Test. The consolidation/augmentation of the current SIMA IPE for the Pilot CC Shop is very useful toward improving SIMA (SD) CC production capability but it does not fulfill the Service Test requirements.

5.2 SIMA SHOP FUNCTIONS & REQUIREMENTS

5.2.1 Concept

A SIMA CC Shop should be an independent Work Center with:

- Staff to provide technical information and assistance for all TYCOM and NAVSEA approved corrosion prevention and CC coating systems to tended ships and other SIMA shops. A supervisory staff trained to allow them to be technically knowledgeable. A Pilot CC Shop Service Test providing hands-on shipboard and IMA experience in the recognition, diagnosis, selection and application of corrosion prevention measures and CC coatings.

- Equipment and facilities industrially engineered for cost effective application of CC systems designated for SIMA delivery. CC Systems 1 and 2 (low- and high-temperature WSA coating) for SIMA delivery. Corrosion Control System 4 (powder coating) by "pre-placed contracts" with local industry until the production character and volume can be determined and an analysis performed on their cost-effectiveness.

The development, installation, maintenance and modernization of all IMA industrial facilities for delivering CC services is based on using engineered "turn-key" modules which can be procured in the Industrial Plant Equipment (IPE) Program and which can be installed in or next to existing facilities without Military Construction (MILCON) resources. The CC system IMA delivery modules could also be standardized throughout the Navy, being used both in the training and in organizational, intermediate and depot maintenance levels.

5.2.2 Tasks and Functions for the SIMA Corrosion-Control (CC) Work Center

The recommended tasks and functions of the SIMA CC Work Center are:

- Provide technical assistance and deliver production support for designated corrosion prevention and corrosion-control (CC) coating applications:
  - Operate and administer the CC Shop as a Lead Shop to provide technical information/assistance and ship-to-shop, open-shop and shipboard services to tended ships.
  - Operate and administer the CC Shop as an Assist Shop to provide shop-to-shop technical information/assistance and coating services to other SIMA Lead Shops.
  - Assist the Planning Department in the planning, estimating, scheduling and coordination of CC Tech Assist and CC coating services in accordance with shop capabilities and workload capacity.
  - Maintain the technical and productive capability to diagnose and select appropriate corrosion prevention measures and apply CC coatings. Train and maintain requisite numbers of certified personnel for delivering the designated CC coating systems.
  - Assist ship and SIMA shops in planning and scheduling CC Tech Assist and coating services.
  - Establish, organize and accomplish programs to improve CC Tech Assist and services delivered by SIMA to include industrial equipments and processes, facilities and information for planning, scheduling and management.
  - Provide technical assistance to other COMNAVSURFPAC SIMAs in their installation and operation of a CC Shop.
  - Conduct periodic reviews of those NAVEDTRA Rate Training Manuals containing CC information and develop the Command's comments and recommendations for submission to NAVEDTRA. Conduct similar reviews for other publications, as required. Train Naval Reservists as assigned.

5.2.3 Workload Potential

There is a very large workload potential of shipboard components and areas that could use corrosion prevention measures and improved CC coatings. Figure 5-1 illustrates the potential magnitude of the workload authorized in the DD 963 and AO 177 Class ships from the NAVSEA Ship CC manuals and in the FFG 7 and CG 47 from Engineering Change Notices to the construction contract. Similar listings could be developed for other ship classes. It is recognized that CC services provided by SIMA will have the maximum benefit for older classes of ships. The NAVSEA Ship Specifications, Ship Class Corrosion-Control Manuals, and the Ship Class Maintenance Plan will list all NAVSEA authorized items.

The CC Tech Assist and CC services that could be delivered by SIMA will be limited by the physical capacity of the CC Shop and its manning. The productivity of the CC Shop will depend on "plant capacity and manning" and the initiative, innovation and the ability to effectively work with other SIMA shops and departments and with Ship's Force (S/F) personnel in open-shop and shipboard delivery modes. One of the objectives of the Phase III, Pilot CC Shop Service Test is to establish and "measure" the feasibility and effectiveness of the SIMA (SD) CC Shop's ability to develop and maintain an awareness for an action to use proper CC measures/coatings among other SIMA shops and tended ships.

5.2.4 CC Shop Industrial Plant Equipment, Facility and Manning Requirements

5.2.4.1 Industrial Plant Equipment (IPE)

The criteria for sizing and nominating IPE were based primarily on:

- Minimum impact on the MILCON Program;
- Availability of fully engineered portable/containerized units or systems suitable for IMA and S/F use for delivering the various CC systems; and
- Near-term (~3 months) capability to install the IPE, develop IMA and/or S/F process instructions, implement QC program and train/certify personnel to manage and operate the IPE.

Wasteheat Boiler Nos. 1, 2 & 3
Fire Pump FDN's & Fasteners
Firemain Valves & Fasteners
Saltwater Service Valves & Fasteners
BHD Stop Valves & Fasteners
Main Drainage Valves & Fasteners
SEC Drainage Valves & Fasteners
Remote Operating Devices for all Valves
Chill Water Valves & Fasteners
Steam Valves & Fasteners
L.P. Air (oily-air) Valves & Fasteners
AFFF Valves, Pittings & Fasteners
AFFF Conc Tk, FDNs & Fasteners
AFFF Dk & BHD Areas
AFFP Storage Racks
AFFF Hose Reel FDN & Fasteners
AFFF Rm (03-324-1-Q)
Reducing Valves & Fasteners
Strainers (all systems)
Eductor Rm 5-34-0-E
King Post Tk. Nos. 1 & 2
Ammo Strikedown Tk Nos. 1 & 2
Pump & all Chill Wtr Mchry Rm Nos. 1 & 2
Manhole Covers & Fasteners
Trash Compactor (Rm 2-260-2-Q)
Nixie Rm (2-512-1-Q)
Ammo Pallet Stag. (Rm No. 1 2-58-0-Q)
Ammo Pallet Stag. (Rm No. 2 3-4-64-0-Q)
Drainage Eductors
Steering Gear Rm
Galley A.P.C. System FDN & Fasteners
Torpedo Strikedown Lift/Mn Dk Area
Bosn Lockers
Chain Lockers
Heads
Showers
C.G. Lockers
Foul Weather Gear Locker
Light Traps (Brackets, Dk & BHD Areas)
MK 26 Utility Rms
MK 26 Water Injection Accu Tks, FDNs & Fasteners
C.R.P. Head Tanks (Interior)
Filter Cleaning Room
Fan Rooms
Electronic Cooling Rooms
Dome Equipment Room
Access Trunks Open to Weather
Reel Strm. Nos. 1 & 2
Decon Sta. Nos. 1 & 2
Halon Cyl (RM 2-292-2-Q)
Ship Cont. UPS Power Batt Rm
Misc. Valve HYD Cont. Sta. Nos. 1-8
Countermeasure Washdown Valves
Inert Gas Cyl Strm 2-494-2-A
Batt Shop 2-494-1-Q
Towed Array Rm 2-506-0-Q
Vent Valves & Fasteners
Voids (Accessible), Ladders, Piping & Fasteners
Sumps & Drainwalls
Shaft Alley & Sewage Plant No. 2
Cooling Water Rooms
Dk Grating (Top angle Aux Mach Rm)
Aux Machinery Rm Bilges
Main Eng Rm Biles to 1st level of grating
P-250 Pump Racks
Reducing Valves and Fasteners
Mag. Sprinkler System, Valves & Fasteners
Helo Hanger Area
AFFF Hose Reel, Rewind Handles
Misc. Strg Racks & Brackets (Shoring, Battle Helmets, etc.)
Non Struc. Tanks FDNs & Fasteners
Inclined & Vertical Ladders
50 lb. CO_2 FDNs & Fasteners
Sonar Dome (Piping & Electrical Fasteners)
Mis. Storage Lockers
Bleed Air Valves Flanges & Fasteners
Masker Valves, Flanges & Fasteners
FSA 6 in. from BHD & Dk 6 in. from BHD
01 Level & below
Scullery 1-284-1-Q
Dumb Waiter Tk
H.P. Air Compressor Rm
Vert CNVR Tk
H.P. Air Tanks (Eng. Rms, Gen. Rm, Torpedo Rms)
Mis. FDNs (Candy, Coke, Cigarette Machs, Etc.)
Stores Handling Rm
Classified Waste Disposal (02-220-4-Q)
Shops Equipment FDNs
Mag. Sprinkling System, Valves & Fasteners
Heater Rooms, Dk Piping & Brackets
Valve Hand Wheels & Fasteners
OVBD Disc Valves

DD 963 CLASS

Piping Hangers
Torpedo Strikedown Hatch
Watertight Doors & Closures
Boat Control Light Fixtures
Light Fixtures
Floodlight Fixtures
Vertrep Light Boxes
21MC Enclosures
Tilting Whip Antenna, Foundations & Wall
Signal Search Light
AN/SLQ-32 Antenna Foundations & Brackets
Flight Deck Status Light Box
Vent Screens
Scuppers
Steam Valves & Piping
RAS Station Valves & Piping
Conrep Station Sliding Padeye Assembly
Fueling Receiver Support Assembly
Chain Locker Covers and Hawes Pipe Covers
Anchor Windlass Hoist & Brake Control
Stern Capstan Controllers
Boat Davits
Sewage Plant Shore Discharge Connections
Portable Davit Sockets
Roller Chocks
Lifelines & Stanchions
Number 3 SSGTG Exhaust Safety Barrier
Inclined Ladder Brackets
Accommodation Ladder Rigging & Stowage Assy
Compressed Gas Bottle Stowage Racks

FFG 7 CLASS

Scuttle Cover
Flush Hatch Cover
Hatch Scuttle Cover
Flush Scuttle
Chain Screen Cover
Flush Hatch Cover
Raise Deck Cover
Flush Deck Scuttle
Flush Deck Hatch
Hatch Cover
Scuttle Cover
Hatch Handles
Hatch Locks
Dog Legs
12" Hand Wheels
4" Hand Wheels
Flush Hatch Cover
Gear Box Housing
Raise Deck Hatch
Flush Scuttle
Flush Deck Scuttle
Raise Deck Scuttle
Raise Deck
Flush Deck

AO 177 CLASS

Electric & Other Boxes, Lockers & Cabinets
Valves - Steam & Fuel
Pipe Hangers
Fire Station Hardware
FAS/RAS Kingposts & Support Columns
Anti-Slack Device
Life Line Stanchions, Fixed & Portable
Boat Davit Support Columns
Jungle Deck Support Columns
Safety Screens (Hawse Pipe, etc.)
Anchor Windlass
Chain Link Stowage
Equipment/Machinery Foundations
Boat Handling/Stowage Winch Machinery
Unrep Messenger & Phone
Tie Downs
Washdown Components
Doors, Hatches, Scuttles & Access Plates (Including Hardware)
Antenna Mounts
Fuel Hose Rack
Accommodation Ladders
Vent Ducting (Supply)
Rigging Pittings (Blocks/Sheaves)
Vent Diffusers/Intake Plenums
Flag/Jack Staff
Mast Structure (includes Yardarms)

FIGURE 5-1. CANDIDATE ITEMS FOR IMPROVED CC COATINGS

Figure 3-8 gives the major characteristics of the Large, Medium and Small CC Shop. The major IPE items are the installation of four portable containerized WSA systems and one electrostatic powder spray system for the Large Shop; two WSA systems and one powder system for the Medium Shop; and only one portable WSA system for the Small Shop.

5.2.4.2 Facilities

The Small CC Shop was selected for the SIMA Pilot CC Shop Service Test to operate for one year. Accordingly, the facility requirements for the Service Test of the CC Shop are:

- Approximately 1,500 sq. ft. of covered area for consolidation of existing SIMA inventory of CC IPE and the procurement of additional CC equipments for a functional shop to provide both ship-to-shop and shop-to-shop services. Services required are 440 vac, 3-Phase, 60 Hz, 150 amps electric and 100 psig, 250 cfm dry air; and
- Approximately 2,500 sq. ft. of covered area is required for staging the portable/containerized WSA units and to provide a production work area. SIMA (SD) has a 12' x 15' portable building which will also be required if an open area is used. The portable building will provide office, work area and storage for spare parts and consumables. This will require 440 vac, 3-Phase, 60 Hz, 150 amps electric services "trenched" to the WSA units and 110 vac, 3-Phase and 60 Hz, 30 amp electric service to the portable building.

5.2.4.3 Manning

The manning requirements for the CC Shop, independent of military duties, training/certification and personnel "turnover" are presented in Figure 5-2. At the 27 APR 84 IPR, it was decided that the SIMA Pilot CC Shop would be manned with 6 SIMA personnel and contractor technical support personnel during the one year service test (Section 4.2.5).

FUNCTION	LARGE	MEDIUM	SMALL
	4 WSA Sys 1 Powder Coating Sytem	2 WSA Sys 1 Powder Coating System	1 WSA Sys
Supervisory	2*	1	1
Technical Assist Advisor	1	1	1
Material Issue Advisor	2	1	
Powdered Coating Technician	2	2	
WSA Technicians 4 per unit to: . Log In/Out . Preclean & Masking . Surface Preparation . Metal Spraying . Sealing	12	8	4
TOTAL	19	13	6

* One WSA unit manned with one supervisor for the Open Shop mode.

FIGURE 5-2. MANNING REQUIREMENTS FOR THE PILOT CC SHOP

5.3 PILOT CC SHOP

5.3.1 General

As noted in Section 5.1, the scope of SIMA (SD) Pilot CC Shop is directed to establishing the Pilot CC Shop as an independent work center to provide technical information/assistance to tended ships and to other SIMA Shops/Departments and to deliver CC coating services for CC Systems 1 & 2 (low- and high-temperature WSA), Pre-Placed Contract Support for System 4 (powder coatings) and Material Support for Systems 6 through 15 for the proper installation of components preserved with Systems 1, 2 and 4. The Service Test is to be designed around portable/containerized turn-key modules that can easily be installed and used in other SIMAs to provide standardized equipments, industrial processes, and training/certification of personnel. Available resources limits the capability of the Pilot CC Shop to production services for System 1 & 2, and use of Pre-Placed Contract Support for System 4 (until production character and volume are identified) for ship-to-shop and shipboard delivery.

The initiation of the Pilot CC Shop Service Test would require SIMA (SD) to establish an independent CC Work Center. For management control and economy of operation, the current SIMA CC ship-to-shop and shop-to-shop work performed by Shop 31M should be transferred to the "new" CC Work Center. The current SIMA inventory of IPE could be consolidated into the new work center to support both the Pilot CC Program and SIMA's ongoing CC production services. Accordingly, alternate locations were evaluated for the installation of portable/containerized units and for the consolidation of current SIMA (SD) CC assets into the CC Work Center.

> **NOTE:** The Pilot CC Shop finally selected and being installed in Bldg. 61 consolidates the CC equipment and personnel from the Metal Buildup Shop (Shop 31M).

5.3.2 Pilot CC Shop Location Alternatives

Figures 5-3A and 5-3B give the equipment description and plot plan for the portable/containerized WSA system recommended for the Pilot

Service Test. The Flame Spray, Inc. (FSI) Model 5003A Blasting Unit with monorail and Model 5003B Thermal Spray Unit with monorail are recommended. These units will handle components up to six feet in any dimension and provides a 2000 lb. hoist/monorail. The Thermal Spray Unit has a dessicant air dryer to provide clean dry air. Only 440 vac, 3-phase, 60 Hz, 150 amp electric service is required. A skid-mounted 250 cfm air compressor is also provided.

NOTE

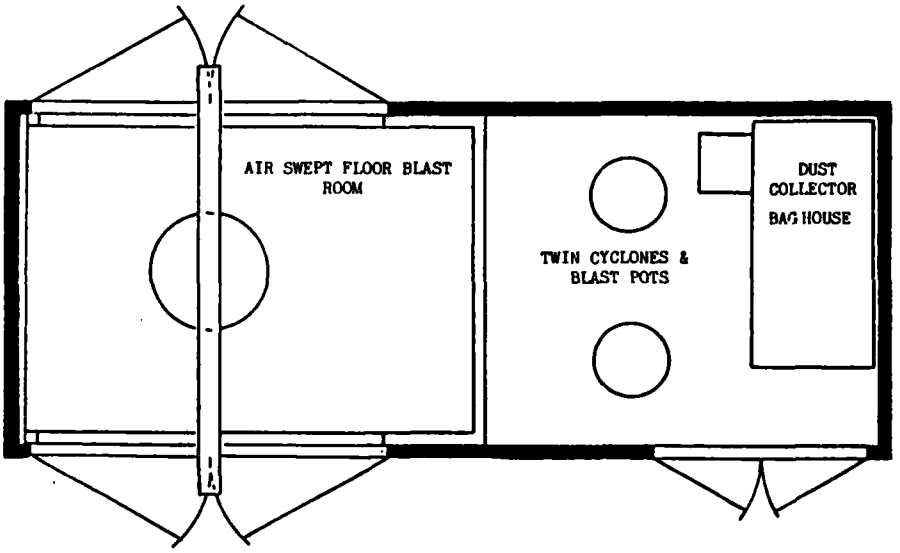
The FSI Model 5005 system was originally considered because it contained an air compressor structurally mounted in the Thermal Spray Unit; however, the FSI Model 5003 (an equivalent unit to Model 5005 but with a skid-mounted air compressor) was finally selected because of lower acquisition cost.

A review of the current SIMA facilities, the Basic Facility Requirements (Ref. 16) and the Master Plan (Ref. 17) were made to develop installation alternatives for the Portable/Containerized WSA System. The two suitable locations available are:

- NW Bay of Building 20: The northwest bay of Building 20 is presently being used by SIMA's Facilities Engineering Machine Shop. This alternative requires the acquisition of a paint spray booth and the fabrication of a Work Center Administration Office. This building has all required utilities. Bldg. 20 is the recommended location for the Portable/Containerized WSA System; and
- NW Area Adjacent to Building 125: Locate WSA units in areas adjacent to Building 125 (Hull Shop). This area is presently the SIMA (SD) Plate and Ordnance Storage yard. This area requires the placement of a portable building (currently in the SIMA inventory) to accommodate the work center office and consumable storage. The relocation of electrical and air services and the fabrication of covered areas for the preclean, coating production and inspection areas would also be required.

Figure 5-4 summarizes the IPE and attributes of the Building 20 and Building 125 locations.

FLAME-SPRAY, INC. 5003 A



STANDARD
CONTAINERIZED BLAST SYSTEM
SIDE LOADING

4674 ALVARADO CANYON ROAD, P.O. BOX 20665, SAN DIEGO, CALIFORNIA 92120 • 619/283-2007 * PATENT PENDING

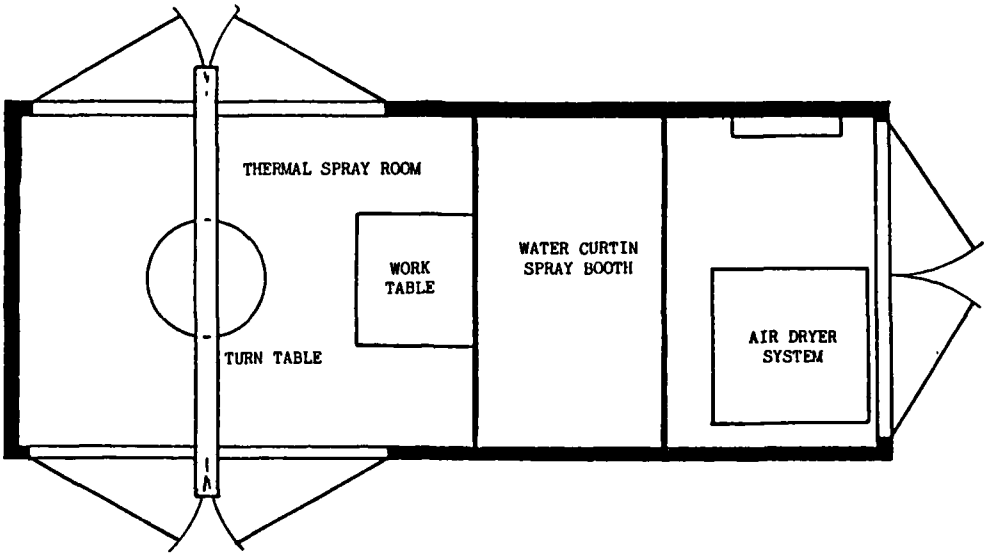
MODEL 5003 CONTAINER "A" BLAST CABINET - SIDE LOAD

(Size: 8' x 8' x 20' / Weight: 13,500/lbs)

1. Self-contained Abrasive Blast Room, for use in strip blasting and anchor tooth blasting for the Wire Sprayed Aluminum Process. Capacity 7½' high x 7½' wide x 10' long.
   1.1 The Abrasive Blast Room is equiped with an air swept floor, which provides an automatic recovery system to reclaim the spent abrasive for re-use.
2. A twin 600/lb Abrasive Pot System is used to rapidly change grits from strip blasting to anchor tooth blasting.
3. 1/each Monorail with 2,000 lbs Hoist
4. 1/each 48" Floor Mounted Turn-Table
5. A completely, Self-contained Dust Collector System is included, which meets all air pollution and safety requirements.
6. All blasting safety equipment and hoses and lighting are also supplied.

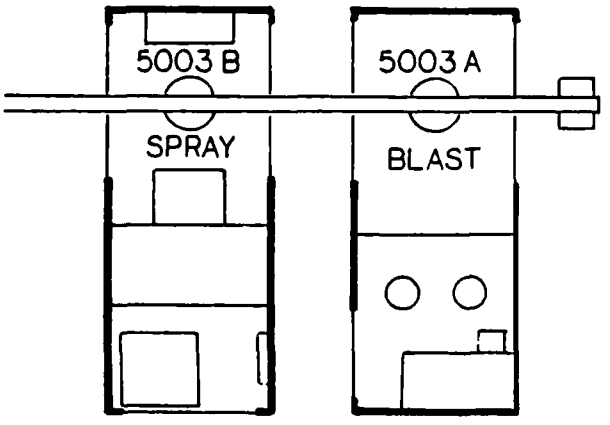
FIGURE 5-3A. Portable/Containerized WSA System - FSI Model 5003A Side Loading Blasting Unit

FLAME-SPRAY, INC. 5003 B



STANDARD
CONTAINERIZED THERMAL SPRAY SYSTEM
SIDE LOADING

4674 ALVARADO CANYON ROAD, P.O. BOX 20665, SAN DIEGO, CALIFORNIA 92120 • 619/283-2007 * PATENT PENDING



MODEL 5003 CONTAINER "B" SPRAY FACILITY - SIDE LOAD

(Size: 8' x 8' x 20' / Weight 14,000/lbs)

1. 1/each - Air Drying System, modified for Wire Sprayed Aluminum applications meeting air quality requirements of DOD-STD-2138.
2. 1/each - Water Wash Spray Booth, modified to meet air pollution requirements and safety requirements. Work area - 7'10" wide x 7'10" high x 10' long.
3. 2/each - Combustion Wire Guns, and all related hoses, gauges, flow meters, wire racks.
4. 1/each Monotail with 2,000 lbs Hoist.
5. 1/each 48" Floor Mounted Turn-Table.
6. A supply of spare parts for the above-mentioned equipment. Estimated 3 months.
7. Electrical Distribution Panels - approved power panels and all safety switches, supplies.
8. Miscellaneous Equipment:

   - 2/each - Work Benches (collapsable) - Air Piping Distribution, all valved compressed bottle gas storage rack. All venting, (intake and exhaust) vents, lockable roof ladder - removable roof - exhaust stock - water tight seals.
   - 1/each - Turn Table (removable).
   - 1/each 250 CFM Air compressor
9. Safety and Quality Assurance Equipment, Ear Protection, Eye Protection. All Q.A. Equipment, supplied to meet the requirements of DOD-STD-2138 (SH).

FIGURE 5-3B. Portable/Containerized WSA System - FSI Model 5003B Side Loading Thermal Spray Unit With Compressor

LOC.	INDUSTRIAL PLANT EQUIPMENT	ATTRIBUTES			
		MASTER PLAN(1)	WITHIN EXP. ARC	FOR	AGAINST
BLDG. 20 (North Bay)	PROCURE: 1. FSI Model 5003 consisting of: a. Abrasive Blasting Unit b. Flame Spray Unit 2. 8' Paint Spray Booth Water-Wash 3. Arc Wire System consisting of: a. Arc Wire Gun b. Automatic Wire Feeder c. Power Supply	YES BLDG. 20 (Will not be demolished during period of service test.)	YES	1. Adjacent to major overhaul areas, Piers 3, 4 & 5. 2. Adjacent to Bldg. 149 CC Work Center recommendation. 3. Excellent location for industrial requirements, i.e., Open Shop, Ship-to-Shop. 4. Large production area. 5. Efficient production flow in Ship-to-Shop and/or Open Shop modes, especially if CC Shop is located in Bldg. 149.	1. Requires relocation of the Facilities Engineering Machine Shop presently occupying the North Bay.
Adjacent to Bldg. 125 in the plate storage yard, SW section.	PROCURE: 1. FSI Model 5003 consisting of: a. Abrasive Blasting Unit b. Flame Spray Unit 2. Arc Wire System consisting of: a. Arc Wire Gun b. Automatic Wire Feeder c. Power Supply	YES	NO	1. Adjacent to Bldg. 125 (Hull Shop) 2. Available area.	1. Requires trenching for electrical and air. 2. Production areas, i.e., Receiving, Precleaning, Sealing and Inspection not enclosed. 3. Potential industrial hazard and nuisance from solvent fumes and open paint spraying.

(1) COMPATIBLE WITH SIMA (SD) MASTER PLAN

FIGURE 5-4 IPE REQUIREMENTS FOR THE CONTAINERIZED WSA SYSTEM IN BLDG. 20 AND ADJACENT TO BLDG. 125 FOR THE PILOT CC SHOP

5.3.3 SIMA CC Industrial Plant Equipment Consolidation Alternatives

The consolidation of the current inventory of IPE to an industrially engineered location will maximize SIMA's current and future production capability. Consolidation of the current inventory would allow SIMA to make use of the Pilot CC Shop Service Test on the containerized units to train additional personnel to the six required for the portable containers. It is envisioned that the CC Work Center would continue and expand their ship-to-shop and shop-to-shop services, especially in providing technical information/assistance to other SIMA (SD) shops and departments. In preference order:

- Relocate and consolidate existing SIMA (SD) CC equipments to Building 149 at the head of Pier 4. This building is presently empty. It is constructed of concrete block and is serviced with all required utilities, i.e., electrical, water and air. This alternative requires the acquisition of additional equipments to make the CC Shop operational. The equipments required are: (1) Paint Spray Booth; (2) Abrasive Blast Pressure Pot (350 lbs.); (3) Abrasive Grit Recovery System; (4) and an Air Filtration and Drying System; and
- Consolidate existing SIMA (SD) CC equipments in Building 61, Shop 31 (Machine Shop). Equipments would require relocation to the southwest corner of the building to maximize productivity.

  NOTE: The Pilot CC Shop being implemented is located in the West End of Bldg. 61; the portable/containerized WSA system outside; the remainder of the CC Shop made up of the CC equipments of Shop 31M (Metal Buildup), inside.

Figure 5-5 summarizes the IPE and attributes of the Building 149 and Building 61 locations.

LOC.	INDUSTRIAL PLANT EQUIPMENT	ATTRIBUTES			
		MASTER PLAN(1)	WITHIN EXP. ARC	FOR	AGAINST
BLDG. 149	• PRESENT INVENTORY: 1. 6' x 6' (360°) Abrasive Blasting Cabinet 2. 8' Metalizing Water-Wash Spray Booth 3. Vapor Degreasing Unit 4. Soundproof Room 12' x 20' 5. Metal Spray Gun Assembly (METCO 12E) 6. Quality Control Equipment • PROCURE: 1. Pressure Pot for Abrasive Blasting 2. Abrasive Grit Recovery System 3. Air Filtration & Dryer System 4. 8' Paint Spray Booth, Water-Wash	YES (Demolition can be delayed for period of service test)	YES	1. Establishes CC Work Center with no colocation of other shops. 2. Adjacent to Piers 4 & 5, location of major ship availabilities. 3. Excellent building for industrial requirements of shop, i.e., production flow, noise abatement, large production area, etc.	1. Requires relocation of CC equipment from Bldg. 61.
BLDG. 61 (West End)	• PRESENT INVENTORY: 1. 6' x 6' (360°) Abrasive Blasting Cabinet 2. 8' Metalizing Water-Wash Spray Booth 3. Vapor Degreasing Unit 4. Soundproof Room 12' x 20' 5. Metal Spray Gun Assembly (METCO 12E) 6. Quality Control Equipment • PROCURE: 1. Pressure Pot for Abrasive Blasting 2. Abrasive Grit Recovery System 3. Air Filtration & Dryer System 4. 8' Paint Spray Booth, Water-Wash	YES	NO	1. Establishes CC Work Center. 2. Only relocation of equipment within Bldg. 61. 3. Should be done in any case to improve productivity of the Shop 31M CC work.	1. Noise hazard for personnel located in West end of Bldg. 61. 2. Dust hazard foil machinery adjacent to CC Work Area. 3. Colocated work centers, i.e., Machine Shop and CC Shop. 4. Inefficient production flow without relocation of major machinery, i.e., milling machines, lathes, etc.

(1) COMPATIBLE WITH SIMA (SD) MASTER PLAN

FIGURE 5-5. IPE REQUIREMENTS IN BUILDING 149 and 61 FOR THE SIMA (SD) CC WORK CENTER

5.4 SERVICE TEST PLAN CONCEPT & SCHEDULE FOR PHASE III

In formulating the Service Test Plan Concept, consideration was given to establishing the major events that must occur and in what time frame these events would be performed. In the IPR (27 April 1984) a decision was made to plan the service test duration for 12 months. Within this period, sufficient data would be obtained in planning, workload, production and training to realistically assess the requirements for a permanent CC Work Center in the ship-to-shop, shipboard, open-shop and shop-to-shop modes.

Under Phase II, two major events must be initiated. SIMA (SD) has to establish a Pilot CC Work Center and place it in operation, i.e., assignment of personnel, facilities, organizational responsibilities, etc. CNSP (N81) must identify the resources to be allocated to procure or lease the portable/containerized flame spray system. Phase III will follows these events.

Figure 5-6 depicts the proposed Phase III test sequence. In the first month, training/certification would be performed for the assigned SIMA personnel, followed by the first ship availability in a ship-to-shop mode. This assignment would be followed by a second or third availability before shifting to the shipboard mode. The transition will be made when the training, production and quality control procedures have been fully developed and validated for the shipboard mode. This will include shipboard procedures and equipment for interference removal/reinstallation, abrasive-blasting-debris control and shipboard-mockup training.

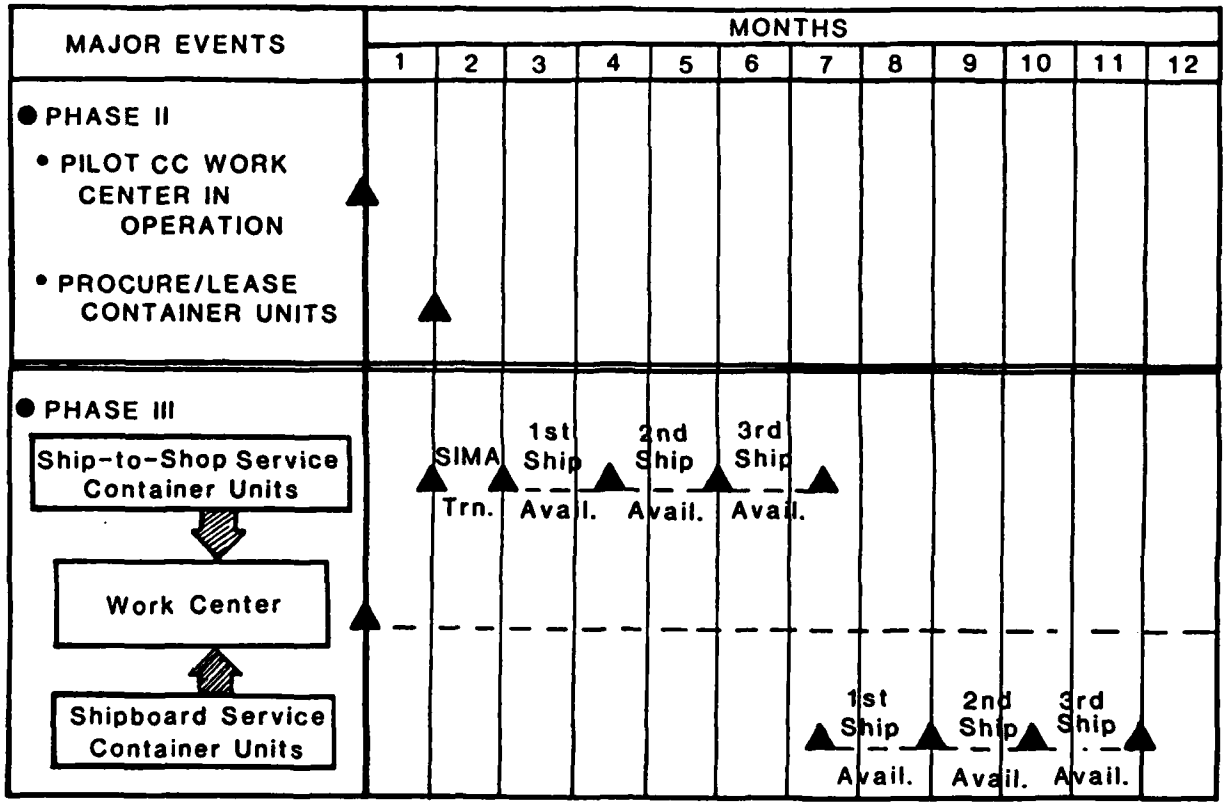


FIGURE 5-6 SERVICE TEST PLAN CONCEPT & SCHEDULE FOR PHASE III (SERVICE TEST)

5.5 RECOMMENDATIONS FOR THE BASIC FACILITY REQUIREMENTS (BFR) FOR PLANNING THE MASTER PLAN UPDATE

5.5.1 General

The Shore Intermediate Maintenance Activity (SIMA) is a tenant command located at the Naval Station, San Diego, California. its purpose is to provide intermediate level maintenance to ships, training of personnel assigned, and development of new repair techniques. During recent years, the emphasis of SIMA operations has shifted from training personnel to primarily ship repair production.

SIMA employs over 1,600 personnel in nearly 40 shop buildings distributed along a mile of the Naval Station waterfront. Typical production flow is ship-to-shop movement of equipment from piers, including SIMA shop-to-shop interaction. SIMA's proximity to the waterfront and main gate of the Naval Station justifies careful planning of future facilities as they will greatly affect the host command.

The SIMA Development Plan or Master Plan (Ref. 17) provides for the orderly development of the activity's occupied land and facilities while effectively considering planning interaction with the Naval Station. The SIMA facility requirements in the Master Plan are based on the SIMA Basic Facility Requirements (BFR) (Ref. 16). The SIMA (SD) Master Plan was reviewed with regard to the installation and operation of a permanent CC Work Center. No specific changes are recommended until completion of the Pilot CC Shop Service Test. The Service Test will validate the requirements for and the feasibility of the organization, manning, IPE and production services for the permanent CC Work Center. General planning information, however, is provided in the following section.

5.5.2 Comments/Recommendations for the Basic Facility Requirements

The BFR is a major planning document for the SIMA Master Plan. A review of the BFR indicates that the SIMA (SD) organization and the task and

function statements in the BFR (and the Master Plan) subsume the recommended CC Work Center tasks and functions aforementioned in Para. 5.2.2.

Of the six groups in the Production Department, the Services Group has similar functional responsibilities closest to providing CC services. The Services Group in Naval shipyards and commercial shipyards provide CC services. It is pointed out, however, that WSA coating systems are delivered by the Welding Shops in the Naval shipyards (except Pearl Harbor NSY) and predominantly by the Painting Departments in the commercial shipyards.

It is recommended the CC Work Center be placed in the SIMA Service Group and that the Service Group's facility requirements be updated accordingly. Specifically, Building D in MILCON Project P-011 should be modified to provide the Service Group with covered space to house the CC IPE. This space should be so located that the containerized units planned for the Phase III CNSP/SIMA CC Program can be installed outside Bldg. D adjacent to the CC shop to marry up with the containerized units' monorail system and used for ship-to-shop and shop-to-shop work when the containerized units are not being used for shipboard and open-shop work. Approximately 2,000 sq. ft. of covered space will be required for the CC Shop. Approximately 3,000 sq. ft. of colocated open space will be required for the containerized units. The major utility services required are 440 vac, 3-Phase, 60 Hz, 150 amps electricity and 100 psig, 250 cfm dry air.

There is a general but unspecified long-term requirement for approximately three 3,000 ft. open work areas, each with a permanent or portable building with about 200 sq. ft. area near Pier 2 (Bldg. 61), Pier 7 (e.g., Bldg. 370) and Pier 11 to provide open-shop work areas for S/F personnel using the containerized units.

SECTION 6

PHYSICAL SYSTEM DESIGN
(Subtask II-1)

6.1 GENERAL

The objective of Subtask II-1 is to develop and design the physical system to support the portable/containerized wire sprayed aluminum (WSA) system selected in the In-Process Review of 27 April 1984 (Section 4). The physical system design includes requirements and recommendations for:

- Facility arrangement and location;
- Initial equipment procurements;
- Safety;
- EPA environmental controls; and
- Logistics.

The scope of work for Subtask II-1 was to perform a review of the available production facilities/areas and determine the physical size, utility availability and, if any, equipment dimensional restrictions that exist in order to develop specific recommendations for the physical design. The approach used was to visit each proposed site and review as-built and/or current drawings. From this information, the Pilot CC Shop preliminary layout drawings were prepared with consideration to the industrial engineering requirements for production efficiency.

6.2 FACILITY ARRANGEMENT AND LOCATION

Section 5.3 indicated from a review of the current SIMA facilities, the Basic Facility Requirements (BFR) (Ref. 16) and the Master Plan (Ref. 17), that two locations were determined to be suitable. The first location was adjacent to Building 125 (Hull Shop) in an area bordering Cummings Road and Ward Road (see Fig. 6-1).

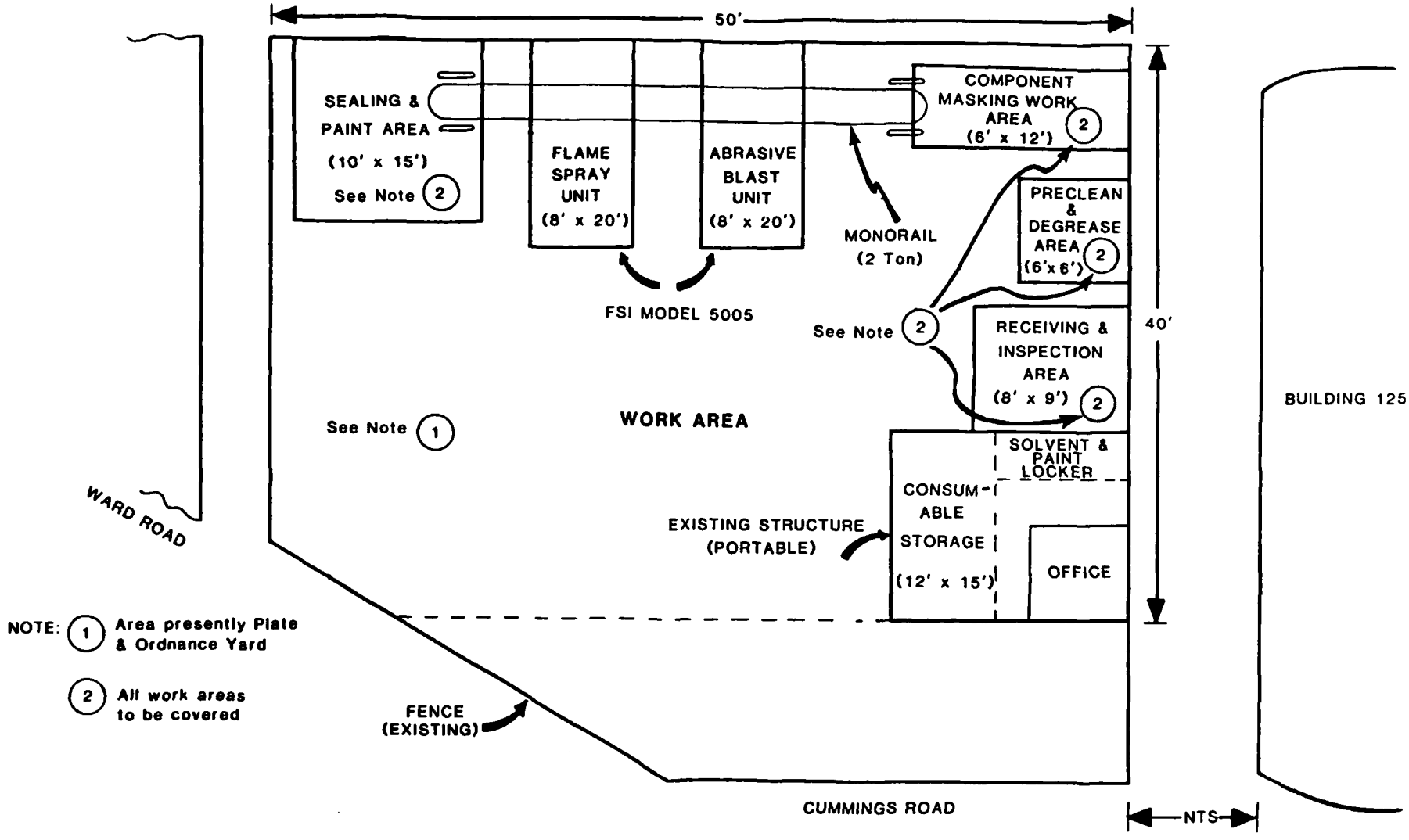


FIGURE 6-1 PILOT CC SHOP LAYOUT ADJACENT TO BUILDING 125

The second location recommended is the northwest bay of Building 20, presently housing the SIMA (SD) Facility Engineering Machine Shop (see Fig. 6-2). In addition, a recommendation for SIMA Industrial Plant Equipment (IPE) Consolidation was made which relocated the present capability (IPE) from Building 61 to Building 149 at the head of Pier 4 (see Fig. 6-3).

The Small CC Shop, regardless of location, requires work areas for the Precleaning and Solvent Degreasing Operation; the Component Masking Area; the Sealing and Paint Area; the Receiving and Inspection Area; Consumable Storage Area and an Office Area for the Production Supervisor, shop records and quality control equipments.

For the SIMA (SD) Pilot CC Shop to function in an efficient manner and allow a realistic evaluation of production capability during the Service Test (Phase III), the shop should be located as close as possible to the majority of ships in availability. With this concept as a guildline, the following criteria were considered for the Pilot CC Shop:

- Available SIMA (SD) facilities near Piers 3, 4 and 5;
- Sufficient utility capacity and availability;
- No major building/area renovation required; and
- Available SIMA (SD) work areas near Piers 3, 4 and 5.

Building 20, at the head of Pier 4, meets the first three criteria. The northwest bay is an ideal location to establish the ship-to-shop mode for the Service Test and, when complete, gives easy access to the shipboard Service Test mode. This location was selected by SIMA (SD).

NOTE: Following the Bldg. 20 selection, the Federal Fire Marshall of the Naval Station indicated that any new work area in Bldg. 20 must meet a 2-hour fire safety criteria. For the Pilot CC Shop in the NW Bay, 3/4-in wallboard and a sprinkler system would be required. Additionally, the paint spray booth cannot be located in the same interior space as the wire spraying unit to minimize the paint-solvent fume-ignition hazard.

Utility Requirements:

1. Electrical: 440 VAC, 3-Phase, 60 Hz, 150 AMPS
2. Air: 100 psig, 250 CFM
3. Water: 70 psig, 1/2-inch line

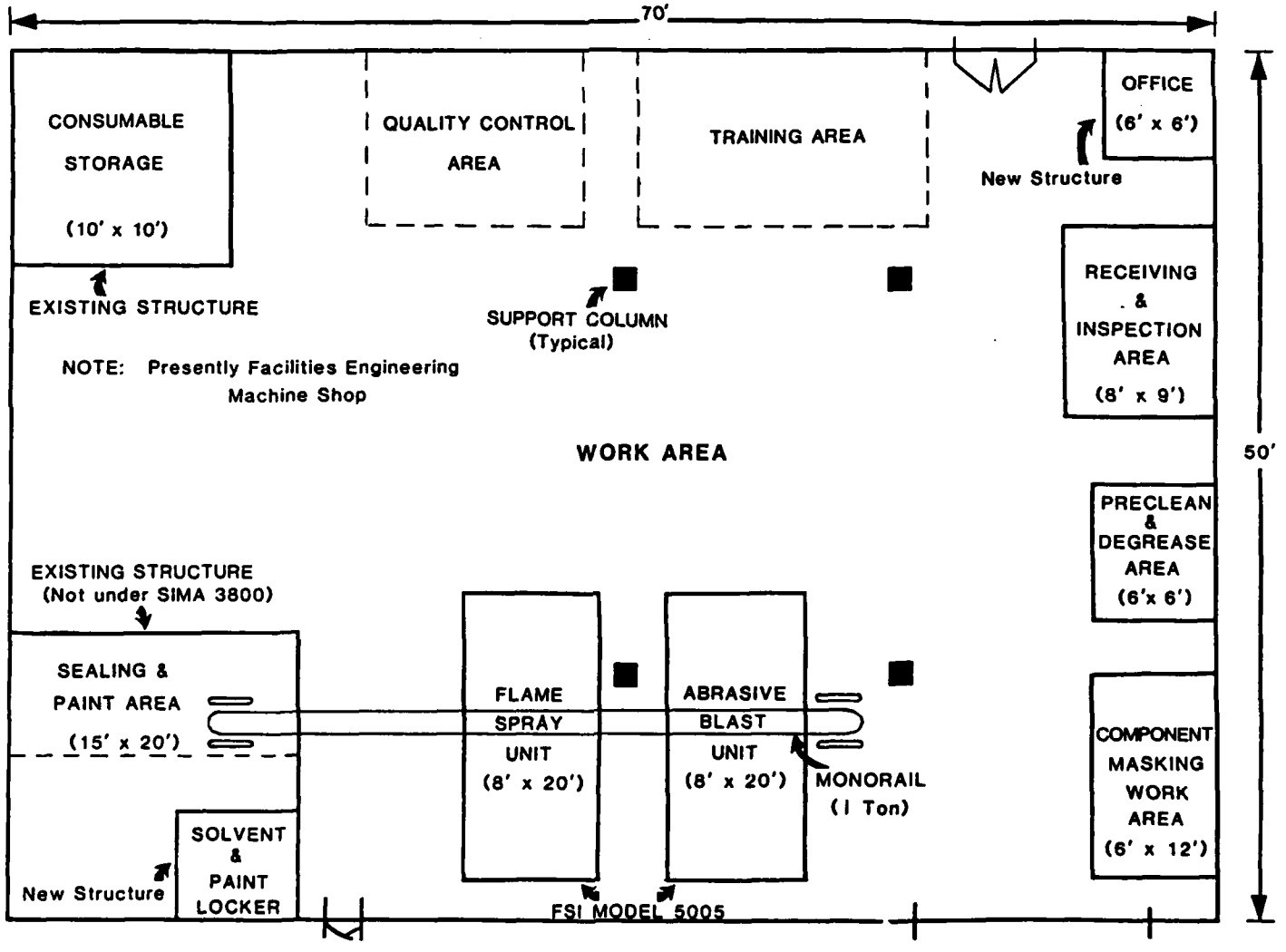
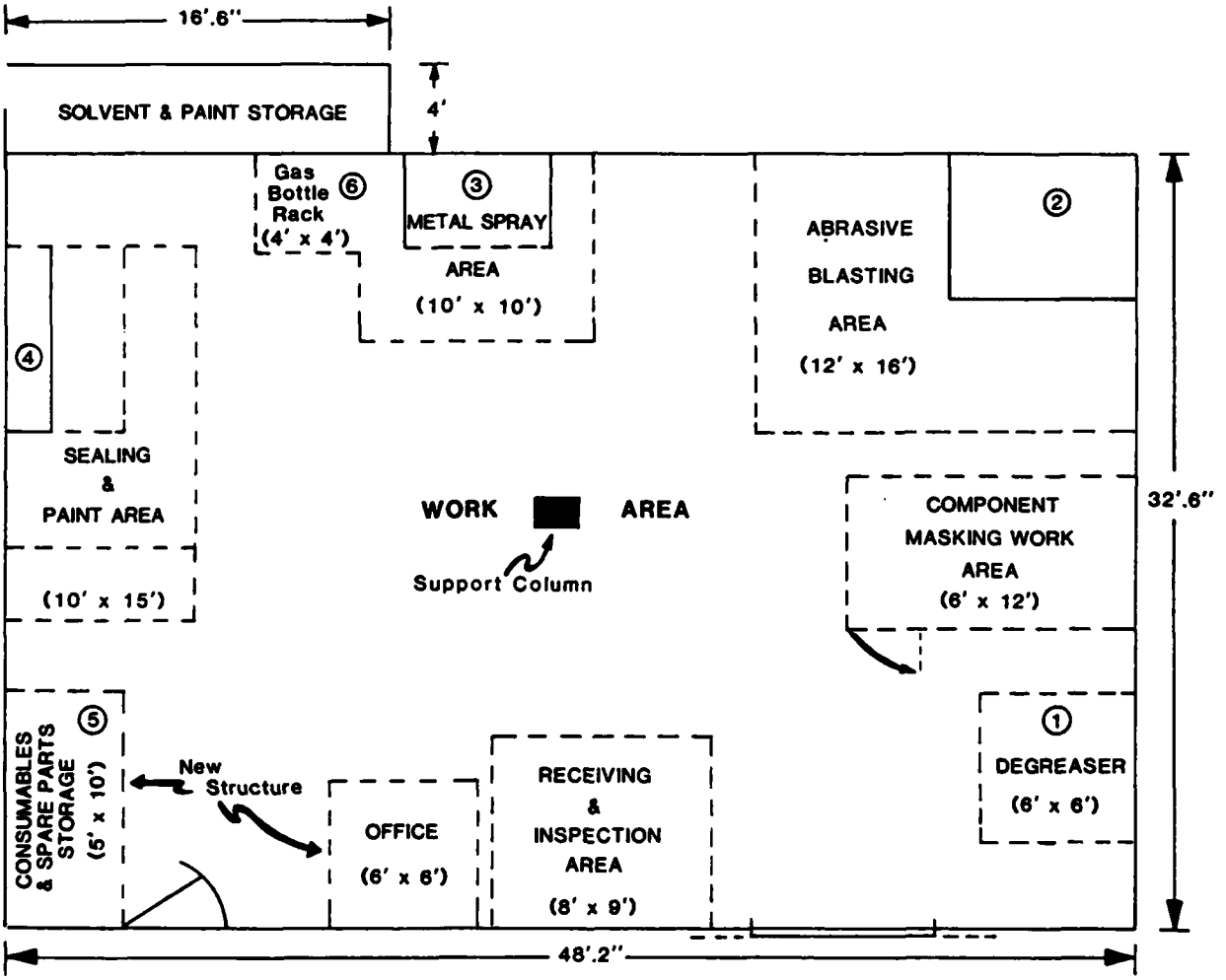


FIGURE 6-2. PILOT CC SHOP LAYOUT - BLDG. 20

Utility Requirements:

1. Electrical: 440 VAC, 3-Phase, 60 Hz, 150 AMPS
2. Air: 100 psig, 250 CFM
3. Water: 70 psig, 1/2-inch line

Item	Description
6	Gas Bottle Rack
5	Storage Racks
4	Water-Wash Spray Booth, Exp.
3	Water-Wash Spray Booth, Exp.
2	Abrasive Blast Unit
1	Vapor Degreaser



NOTE: BUILDING PRESENTLY NOT OCCUPIED.

FIGURE 6-3. SIMA (SD) CC SHOP LAYOUT - BLDG. 149 IPE CONSOLIDATION

6.3 PILOT CC SHOP EQUIPMENT

At the In-Process Review (IPR) (Section 4), the Large, Medium and Small Pilot CC Shop concepts were presented. A decision was made to size the shop to the "Small" configuration. This dictated the number of equipments and size to be implemented. The "Small CC Shop" incorporates the FSI Model 5003A, Sandblast Portable Containerized System and FSI Model 5003B, Flame-Spray Portable Containerized System. Model 5003A contains a monorail system; Model 5003B also contains a monorail system. The equipment chosen allows for a higher degree of independence, since they require only electrical power for operation. In addition, the monorail capability allows for a higher degree of production efficiency and a more diverse component workload.

6.4 SAFETY

Safety requirements are presented in Section 9 of this Report.

6.5 ENVIRONMENTAL

The portable/containerized units are engineered and fabricated to meet EPA requirements. They have been "permitted" for use at Todd Shipyard, San Pedro, CA. (South Coast Air Quality Management District, Permit to Operate Nos. M37422, M37424 through M37426 and M38380 through M38383 all renewable on 5/16/85.)

6.6 LOGISTICS

The portable/containerized WSA system is the major equipment selected for the Pilot CC Shop. It is delivered "turn-key" with all production, QC and safety equipment and procedures to meet the requirements of DoD-STD-2138(SH) (Ref. 6) and has been "permitted" demonstrating that the FSI containerized system meets the EPA requirements. NAVSEA has conducted an on-site technical engineering review of these units and found them "in full compliance with the requirements defined in DoD-STD-2138."*

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* COMNAVSEASYSCOM ltr. 9631, Ser. 05M1.14/227 to Flame Spray, Inc., 13 July 1984

The following technical information is delivered with the containerized system:

- WSA operator training course;
- Component equipment preventive maintenance;
- Component equipment corrective maintenance;
- Quality control equipment and procedures; and
- System installation and operation.

The estimate of consumable materials required for initiating shop production, based on one shift (8 hours) for three months, are:

- Aluminum wire (300 lbs.);
- Cleaning solvents (20 gals.);
- Abrasive grit (3 tons);
- Paints (50 gals.);
- Sealers (20 gals.);
- Masking material (72 rolls of tape, assorted plugs); and
- Quality control materials (10 rolls of profile tape; bend coupons, etc.).

Total estimated cost for three months operation is $11K. The one-year Service Test (Phase III) will monitor and develop labor and material costs for representative categories of topside shipboard components in the ship-to-shop and shipboard delivery modes.

SECTION 7

INDUSTRIAL PROCESS INSTRUCTIONS FOR NAVSEA CORROSION-CONTROL SYSTEMS 1 & 2 (Subtask II-2)

7.1 GENERAL

Corrosion-Control Systems 1 & 2 (high- and low-temperature wire sprayed aluminum (WSA)) were selected for SIMA (SD) Pilot CC Shop delivery using the portable/containerized WSA System (Flame Spray, Inc., Model 5003A/B) installed in the NW Bay of Building 20. Accordingly, the process instruction for applying WSA was developed using DoD-STD-2138(SH) (Ref. 6) as the primary technical reference and specification. The format and content of the process instruction is based on the proposed NAVSEAINST 5240.1A, Management Control of Shipyard Industrial Process Instructions (Ref. 18 and personal communication with J. Fuller, SEA 0704, 6 August 1984).

7.2 PROCESS INSTRUCTION DEVELOPMENT

The recommended SIMA (SD) industrial process instruction developed for the application of the wire sprayed aluminum (WSA) coating system is presented in Appendix B. It is based on the technical requirements of DoD-STD-2138(SH) (Ref. 6) and formatted in accordance with the proposed NAVSEAINST 5240.1A (Ref. 18).

7.2.1 Technical Specifications and Requirements

DoD-STD-2138(SH) is the primary technical requirement for the application of WSA coatings in the Navy (Ref. 6). The following secondary references were used:

- NSTM, Chapter 631, Preservation of Ships in Service (Ref. 5)
- NAVSEA Shipboard Corrosion-Control Advisories (Refs. 19-23)
- Puget Sound NSY Process Instructions on WSA (Ref. 24)
- Flame Spray, Inc. Process Control Procedures for WSA (Ref. 25)

These references were used to develop the technical content, quality assurance/control, safety and environmental controls.

7.2.2 Equipment and Method

The equipment and method sections of the process instruction in Appendix B are based on the use of the portable/containerized WSA system.

The portable/containerized WSA system, planned to be installed in the NW Bay of Building 20, has been designed and fabricated to meet the DoD-STD-2138(SH) (Ref. 6) requirements. It has been installed and used by industrial activities (e.g., Peterson Boat, Newport News Drydock and Shipbuilding, Philadelphia and Long Beach NSY) and Ship's Force during overhaul (USS SHASTA, J. DANIELS, ADAMS, CORONADO, DAHLGREN, FARRAGUT, HOEL, BARBEY, NEW JERSEY and GUADALCANAL) to produce the NAVSEA designated CC Systems 1 & 2.

The industrial process or method is based on a logical sequence of operations, inspections and QC checkpoints. The Production Flow Chart (Fig. 3, Appendix B) was "paper checked" with SIMA (SD) 7000 (Engineering and Technical Services Dept.). Code 7100 assigned SIMA (SD) Process Instruction No. 7100-18-84 to Appendix B; it will be the coordination draft until it can be amplified and validated with the portable/containerized WSA system installed outside Building 61. The SIMA Pilot CC Shop will be certified in accordance with DoD-STD-2138(SH) by the SIMA Quality Assurance Department.

7.2.3 Operator Training and Certification

The primary references used for training operators for applying the WSA coating system are the Naval Reserve IMA-7 Training Program (slide tape) (Ref. 26) and NAVSEA Metal Sprayed Coating Systems Training Manual (Ref. 27). These references are fully proceduralized job performance aids which gives the step-by-step procedures for surface cleaning, masking, anchor-tooth blasting, thermal spraying, sealing, quality control and the wire-spray gun disassembly and maintenance. Refs. 26 and 27 were originally developed by CNSP 43A and Flame Spray, Inc. in 1980.

NOTE:

For the Pilot CC Shop Program, "factory training" in the operation and maintenance of the portable/containerized WSA System will be delivered by Flame Spray, Inc. (included in the purchase or lease price).

The primary certification reference is DoD-STD-2138(SH) (Ref. 6) and will be performed by the SIMA (SD) Quality Assurance Department.

SECTION 8
QUALITY ASSURANCE (Subtask II-3)

8.1 GENERAL

The objective of Subtask II-3, Quality Assurance (QA), is to develop a QA Program for those corrosion-control (CC) coating systems selected for the SIMA (SD) CC Pilot Shop Service Test and to recommend the inclusion of the CC quality control (QC) elements into the SIMA (SD) QA Program.

The scope of the QA review and analysis included the collection and review of:

- Pertinent QA and QC publications (Refs. 5 and 28-33), and
- QC requirements for CC Systems 1 and 2 (high- and low-temperature wire-sprayed aluminum (WSA) and CC System 4 (powder coating) (Refs. 5, 6 and 24).

The existing SIMA QA Program, based on the COMNAVSURFPAC IMA Quality Assurance Manual (Ref. 30), requires the designation of CC Systems 1, 2 and 4 for the Pilot CC Shop as Special Processes (see Para. 8.2.5) and personnel certification for the planning, production and quality control of those Special Processes (see Para. 8.2.6).

8.2 QUALITY ASSURANCE PROGRAM

8.2.1 Quality Program Management and Responsibility

SIMA (SD) Code 5000, Quality Assurance, establishes and manages the QA Program. They have the responsibility, authority and organizational freedom to identify and evaluate problems and to initiate or recommend solutions.

The primary responsibility for quality of workmanship rests with the individual, non-supervisory personnel who have been assigned to perform the work. That individual's skill performance is the first guard against degrading the quality and reliability that was (or is being) designed into the product they are assigned to work on.

The technician's responsibility for quality is shared by his supervisor and all higher levels of management who must ensure that the technician has had the requisite training, develops and maintains the required skills and proficiency, is provided sufficient guidance and direction to accomplish the task assigned, and then must monitor performance to the quality standards of workmanship established by SIMA (SD).

8.2.2 Planning

Planning is an integral part of and shall provide for implementation of quality program control and assurance actions in the day-to-day performance of work orders. During the work planning phase, the Planning Department has the prime responsibility to review work order requirements and applicable specifications/instructions to identify quality requirements. They are responsible for making timely provisions for quality program elements, such as special controls, inspections, verifications, process procedures and controls, test equipment, documentation (including record requirements) and new skills that may be required by the specification or modifications to the quality assurance program to assure that quality and reliability is preserved for each of the CC systems.

8.2.3 Records

Records are considered one of the principal forms of objective evidence of quality. During the Service Test, the following quality control data will be collected and analyzed:

- Inspection and test;
- Failures;
- Preventive action;
- Repairs;

- Waivers and deviations, as required;
- Corrective action; and
- Controls applied to production, material treatment, destructive and non-destructive test processes, etc.

8.2.4 Process Controls

Appropriate controls shall be established on all processes used to provide reasonable assurance that specified requirements are achieved and maintained.

8.2.5 Special Processes

A special process is a method requiring qualification of personnel, procedures or equipment to provide necessary assurances that technical specifications are achieved. For SIMA (SD), the following CC systems are designated "Special Processes" and will be incorporated into the SIMA QA Program:

- Wire Sprayed Aluminum - High Temperature - CC System 1;
- Wire Sprayed Aluminum - Low Temperature - CC System 2; and
- Powdered Coatings (Electrostatic or Fluidized Bed) - CC System 4.

8.2.6 Personnel Certification

Certification of special process personnel shall be obtained as specified in the governing specification for the process. This shall include a training program that leads to a determination by competent authority of the candidate's technical/skill competence by means of tests, measurements and/or observations. A method shall be developed for identifying those personnel who have been certified to perform a special process. Certification will only be valid for a specific period of time. Certification may be renewed upon

presentation of evidence that the candidate has met periodic training or equivalent work requirements necessary to maintain an acceptable level of competence.

8.2.7 Audit

The audit of the SIMA QA Program should be expanded to include the audit of the SIMA CC Shop. The initial and necessary elements and measured parameters will be proposed in the Pilot CC Shop Test Plan and measured and validated during the Service Test.

8.3 QUALITY CONTROL PROGRAM

8.3.1 Requirements and Procedures for CC Systems 1 and 2 (High- and Low-Temperature Wire Sprayed Aluminum) and CC System 4 (Powder Coating)

DoD-STD-2138(SH) is the primary reference for the use of metal sprayed coatings, CC Systems 1 and 2 (Ref. 6). Para. 5.5 of DoD-STD-2138(SH) details the requirements for "production quality assurance" that will be incorporated into the SIMA process instructions for CC Systems 1 and 2. Para. 2.5.6 of Ref. 24 (Puget Sound Naval Shipyard (PSNS) Process Instructions for Wire-Sprayed Aluminum) details the production quality control (QC) elements that are used in Depot-Level applications of CC Systems 1 and 2.

No SIMA (SD) QC requirements and procedures are required for CC System 4 (powder coatings) because this coating system is planned for delivery through Pre-Placed Contracts during the Service Test. However, in anticipation of designing and installing a powder coating facility for SIMAs, a process instruction with the necessary QC Program will be developed during the Service Test. During the Service Test, the industrial equipments and processes recommended by the powder-coating-products manufacturer and those used by the application contractor will be observed, recorded and evaluated for development of a SIMA powder coating delivery capability.

SECTION 9

SAFETY (Subtask II-4)

9.1 GENERAL

The objective of Subtask II-4, Safety, is to summarize the safety-related elements of those corrosion-control (CC) coating systems selected for the SIMA (SD) CC Pilot Shop Service Test and to assure they conform to the applicable Federal Occupational Safety and Health Administration (OSHA) standards and regulations.

The scope of the safety review and analysis included the collection and review of:

- Pertinent safety publications used in the SIMA (SD) Safety Program (Refs. 33 and 34); and
- Safety requirements for CC Systems 1 and 2 (high- and low-temperature wire-sprayed aluminum (WSA) and CC System 4 (Powder Coating) (Ref. 35)).

The existing SIMA Safety Program, based on Refs. 33 and 34, requires that the safety elements be specified in the process instruction and that the IPE and facility be appropriately configured.

9.2 SAFETY PROGRAM

SIMA (SD) Code 0140, Safety Office, establishes and manages the Safety Program. They have the responsibility and authority to identify and evaluate potential hazards and implement recommended solutions.

The primary responsibility for safety rests with the individual, non-supervisory personnel who have been assigned to perform the work. The individual's skill level and knowledge of potential hazards is the first guard against unsafe conditions.

The operator's responsibility for safety is shared by his supervisor and all higher levels of management who must ensure that the operator has had the requisite training, is provided sufficient guidance and direction and maintains the required proficiency. In addition, periodic monitoring of all safety requirements should be made.

9.3 SAFETY REQUIREMENTS FOR CC SYSTEMS 1 & 2

DoD-STD-2138(SH) is the primary reference for the use of metal spray coatings, CC Systems 1 and 2. Para. 4.1 of DoD-STD-2138(SH) details (Ref. 6) the safety practices that will be incorporated into the SIMA (SD) process instruction for CC Systems 1 and 2. Ref. 33 (Navy Occupational Safety and Health (NAVOSH) Program Manual) is the document that governs all shore operations and Ref. 39 (Navy Safety Precautions for Forces Afloat) governs shipboard operations. These documents will be utilized during the Service Test and for developing the process instructions for ship-to-shop and shipboard delivery, respectively.

9.4 SAFETY REQUIREMENTS AND PROCEDURES FOR CC SYSTEM 4 (POWDERED COATINGS)

No safety requirements and procedures are required for the Pilot CC Shop because this coating system is planned for delivery through Pre-Placed Contracts during the Service Test. During the Service Test, industrial equipments and processes recommended by the suppliers and applicators will be studied for safety-related items, such as the powder materials, electrical power equipment, high temperature curing equipment and personal safety (Ref. 35). These will be recorded and evaluated for incorporation into the SIMA (SD) Safety Program. This information will be incorporated into a powder coating process instruction comparable to that used for WSA coatings.

SECTION 10

FINAL SYSTEM DESIGN (Subtask II-7)

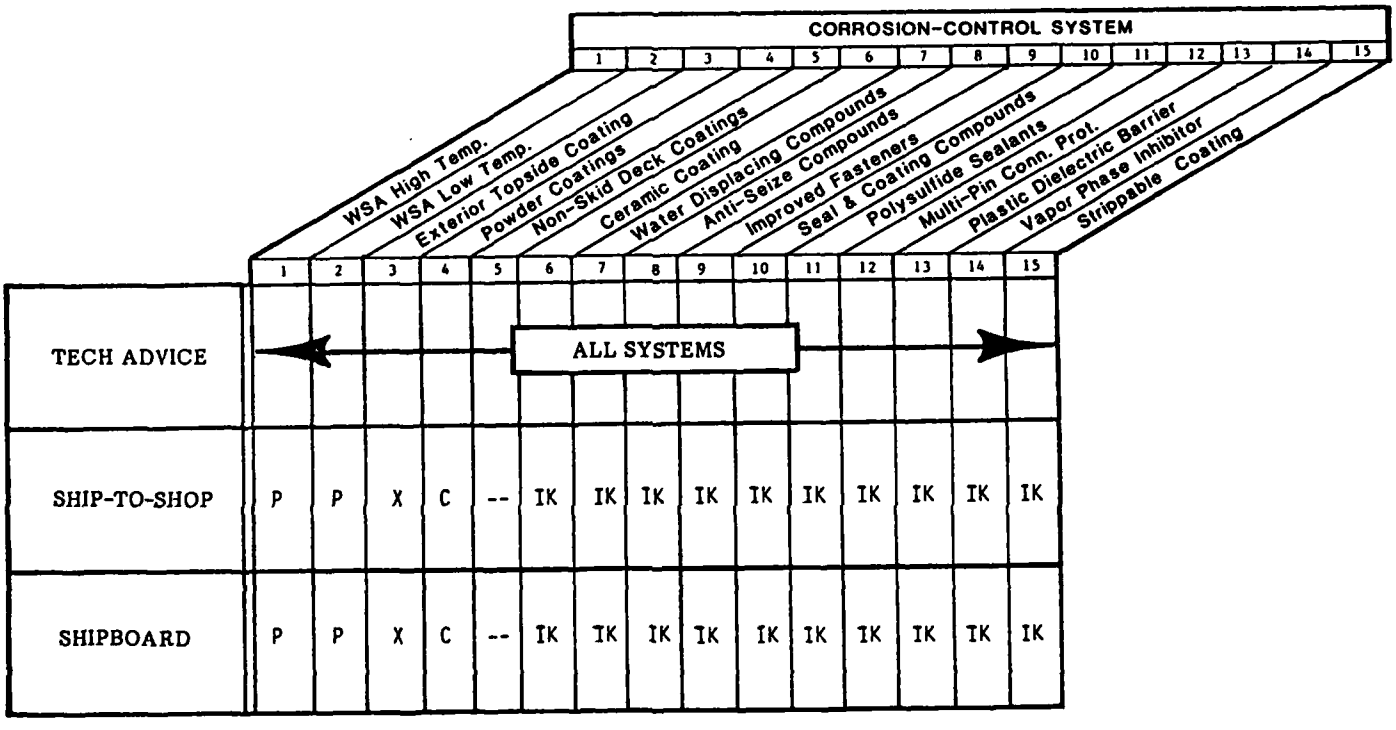
10.1 GENERAL

This section presents the Pilot CC Shop Final System Design based on the decisions of the CNSP N81 (IMA Coordinator) and the SIMA XO and the analysis of the alternate SIMA CC Shop services, IPE, facility and modus operandi presented in the preceeding sections of this report. Figure 10-1 specifies the services to be provided by the Pilot CC Shop.

SIMA (SD) has designated Production Engineering (Code 3800) as lead for the Pilot CC Program, the Pilot CC Shop as Shop 06I and assigned an MMC and an MM1 as the Shop Master and Assistant, respectively.

10.2 FACILITY AND EQUIPMENT

The Pilot CC Shop (Shop 06I) will be located in the NW Bay of Building 20. Figure 10-2 shows the shop layout and work flow with the portable/containerized WSA System, FSI Model 5003. Figure 10-3 lists the major equipments for the Pilot CC Shop and recommendations as to whether they could be transferred from existing SIMA (SD) assets or procured.



P = Production

X = As required to seal components preserved w/WSA (Sys. 1 & 2)

C = By contractor support

IK = Installation Kit as required for proper installation of components preserved w/WSA (Sys. 1 & 2 and 4)

FIGURE 10-1. PILOT CC SHOP SERVICES

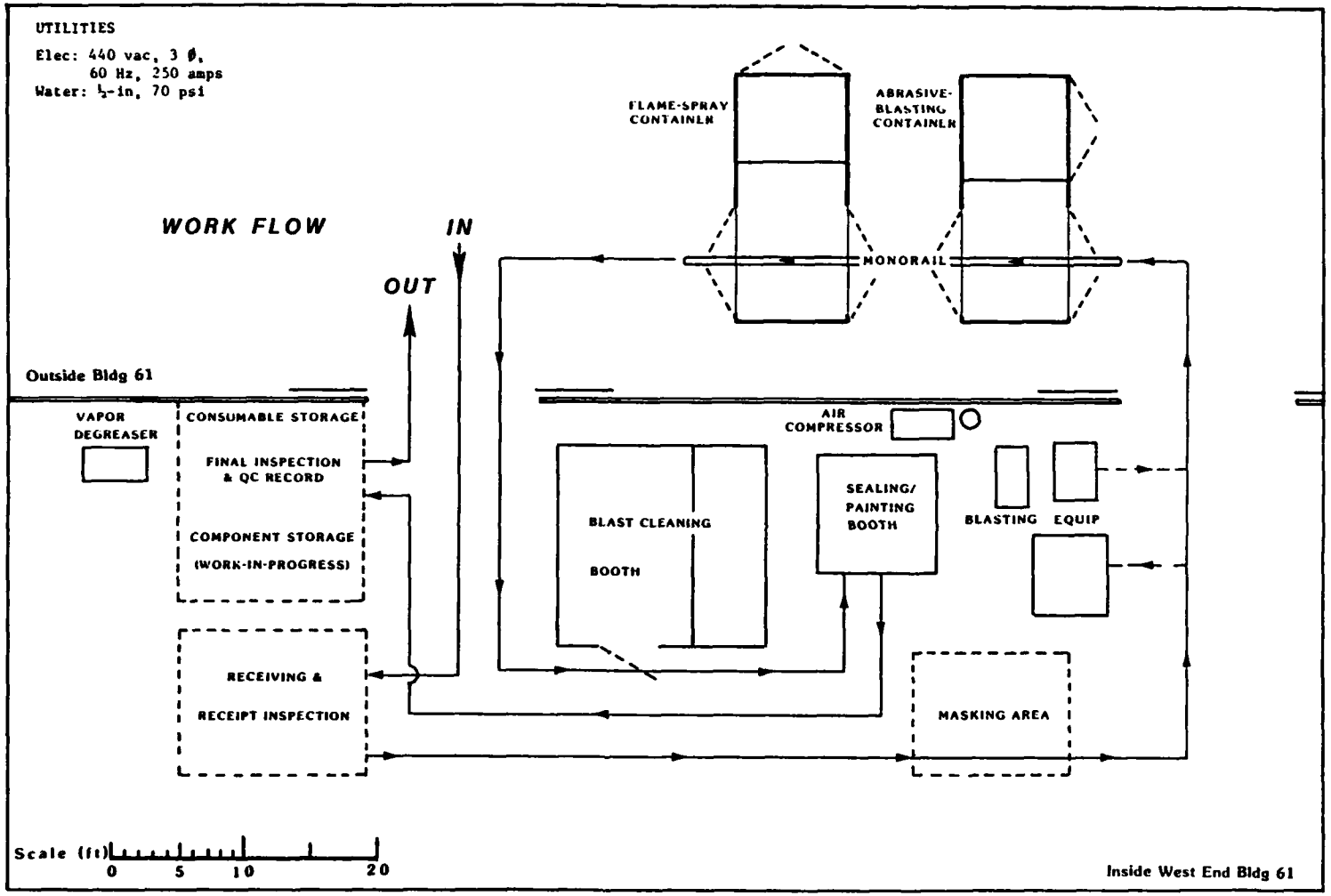


FIGURE 10-2 PILOT CORROSION-CONTROL SHOP, PLOT PLAN (SHOP 06I, West End, Bldg 61)

FIGURE 10-3

MAJOR EQUIPMENT LIST FOR PILOT CC SHOP

Major Equipments	Transfer/Procure
Portable/Containerized WSA System Model 5003*	Procure
Air Compressor (250 cfm, 100 psi)	Procure
Air Receiver	Procure
Vapor Degreaser	Transfer
Lift, manually propelled, battery operated	Procure
Paint Spray Booth, water wash	Procure
300-lb. capacity Blasting Pot	Procure
Vacuum, tank type for blasting media recovery	Procure
Quality Control Instruments	Transfer & Procure
Safety Gear	Procure
Gang Boxes, Work Benches & Storage Bins	Procure

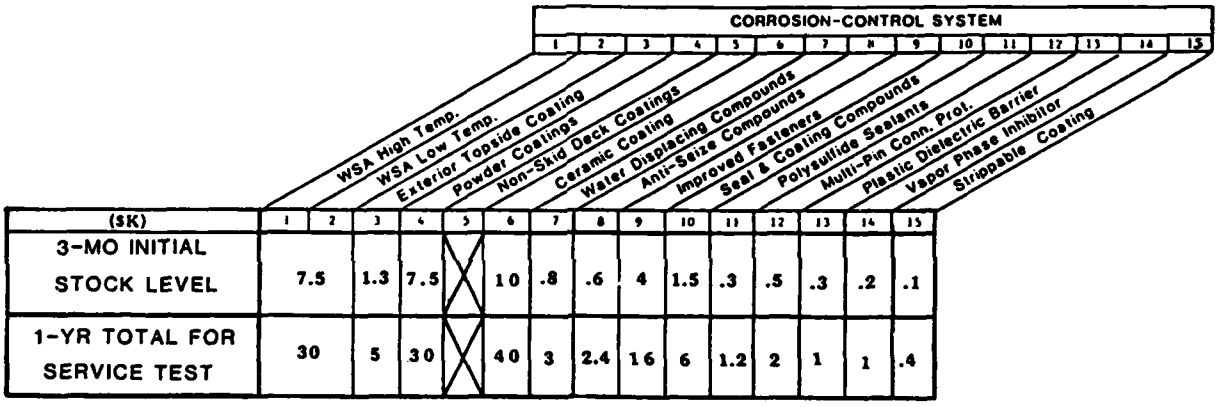
* Includes twin 600-lb. blasting pots; 1-ton monorail and hoist; 48-in. 1-ton floor turntable; boron carbide blasting nozzles; 300-ft. blasting hose; 3-mos. consumables; system operations and maintenance/repair training.

10.3 CONSUMABLE MATERIAL ESTIMATE

Figure 10-5 gives the estimated costs for consumable materials for each of the 14 CC systems to be delivered by the CC Shop. The major consumable cost items are $30K for the blasting media and aluminum wire for the System 1 & 2 WSA coating; $30K for contract services for the System 4 powder coating; $40K for System 6 (Ceramic Fasteners) and $16K for System 9 (Improved Fasteners).

10.4 TRAINING AND CERTIFICATION

The initial training for all SIMA (SD) assigned personnel will be accomplished over a period of 3 weeks for the WSA Systems 1 & 2 with operator certification in accordance with DoD-STD-2138(SH). This training will be provided by Flame Spray, Inc. at their facilities during the manufacture of the Model 5003 System as furnished training/certification services. Additional training for all other CC systems will be performed by ISA for supervisory personnel during the Service Test (Phase III). On-the-job training will be conducted continuously for the certified operators by ISA during the term of the Service Test (Phase III).



(SK)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3-MO INITIAL STOCK LEVEL	7.5		1.3	7.5	X	10	.8	.6	4	1.5	.3	.5	.3	.2	.1
1-YR TOTAL FOR SERVICE TEST	30		5	30	X	40	3	2.4	16	6	1.2	2	1	1	.4

FIGURE 10-5 CONSUMABLE MATERIAL ESTIMATE FOR THE SERVICE TEST

SECTION 11

SERVICE TEST PLAN (Subtask II-7)

11.1 GENERAL

The objective of the Service Test Plan is to test and demonstrate the viability of the SIMA (SD) Pilot CC Shop to deliver technical advice on the 15 NAVSEA-designated CC Systems and to deliver production services for 14 of the 15 CC coatings. The CC Shop will deliver production services for WSA coatings (Sys. 1 & 2), manage contract services for powder coatings (Sys. 4) and apply the other CC systems as necessary for the proper installation of items preserved with Systems 1, 2 and 4 (see Fig. 10-1). The CC Shop will first operate in the Ship-to-Shop mode for 4 to 6 months and then operate in the Shipboard mode for the remainder of the 12-month Service Test (see Fig. 5-6).

This section presents the scope and approach of the Service Test through a functional flow chart of CC work requests from the customer ships through SIMA (SD) planning, scheduling and production, the summary of the data elements that must be collected and analyzed and ending with the Plan-of-Action and Milestones (POA&M).

It is recognized that in introducing and implementing any new program, an understanding of the operational and technical issues must be developed by both the customer ships and SIMA. The technology is essentially in-hand for delivering improved ship corrosion-prevention measures and corrosion-control coatings. However, the major issues of "adequate diagnosis and feasible prescription" and timely/effective/affordable application of corrosion-prevention measures and corrosion-control coatings by organizational, intermediate and depot activities has yet to be realized. This Service Test will develop and test the capability of SIMA (SD) to assist ships in diagnosing CC problems and preparing work requests for their Ship's Force Work List and their deferrals into the Current Ship Maintenance Program (CSMP). The recognition, diagnosis, planning, screening work for accomplishment, delivering ship-to-shop and shipboard services and quality control of the preservation work and installation of components back aboard the customer ship is the "system goal" for the SIMA Pilot CC Shop.

11.2 FUNCTIONAL FLOW AND ESSENTIAL DATA ELEMENTS

Figures 11-1 and 11-2 depict the "system functional flow" of planning and production activities for the CC Shop operating in the Ship-to-Shop and Shipboard modes. Adequate definition of CC problems and of feasible and timely CC fixes are a prerequisite to effective work screening and CC Shop scheduling. The productivity and quality of products of the CC Shop depend upon the facility and equipments, the industrial processes used and the knowledge, skills and proficiency and productivity of the design, P/E and shop personnel.

During the development and initial installation and operation of the CC Shop, the CC subject matter knowledge and skills base at SIMA (SD) will be with the CC Shop personnel and their support contractor.

This CC information must be transferred to other SIMA codes/shops so that these codes/shops may properly introduce and maintain CC measures in the design, P/E, production and quality assurance for the "total SIMA product line." Accordingly, appropriate CC information must be developed and introduced into the SIMA operating guides, instructions and publications and personnel trained in their use.

In the Service Test, the CC Shop Supervisor and Assistant Supervisor will assist P/E to screen, plan and schedule work for the CC Shop until the planning staff has sufficient knowledge and experience. Similarly, the CC Shop Supervisor and Assistant Supervisor will work with other SIMA codes/shops (e.g., Safety, QA and Assist Shops) to introduce and maintain adequate awareness and actions for corrosion prevention measures and CC coatings. The development and delivery of this information is a major element of the Service Test.

The essential data elements for the Service Test are summarized in Figure 11-3 for Start-Up and Pre-Production Activities, Production and Training.

11.3 PLAN-OF-ACTION AND MILESTONES

Figure 11-4 is the Plan-of-Action and Milestones (POA&M) for the Service Test. It is divided into five sections and considers installation and operation of

the FSI Model 5003:

A. Organization (Tasks & Functions, Staffing);

B. CC Shop Installation;

C. CC Shop Operating Instructions/Guides;

D. Training; and

E. Production Operations.

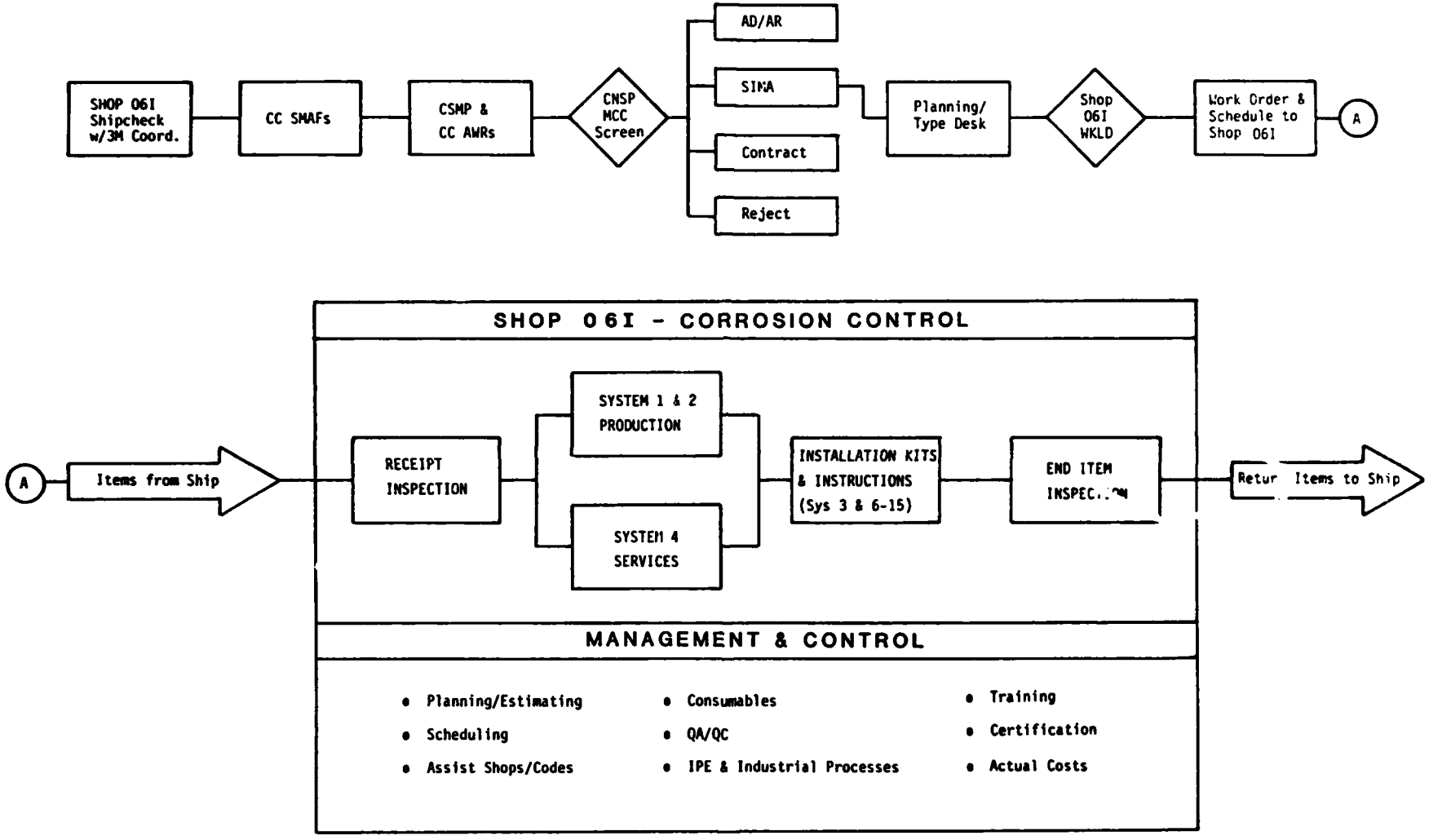


FIGURE 11-1 SHIP-TO-SHOP FUNCTIONAL FLOW FOR THE SERVICE TEST

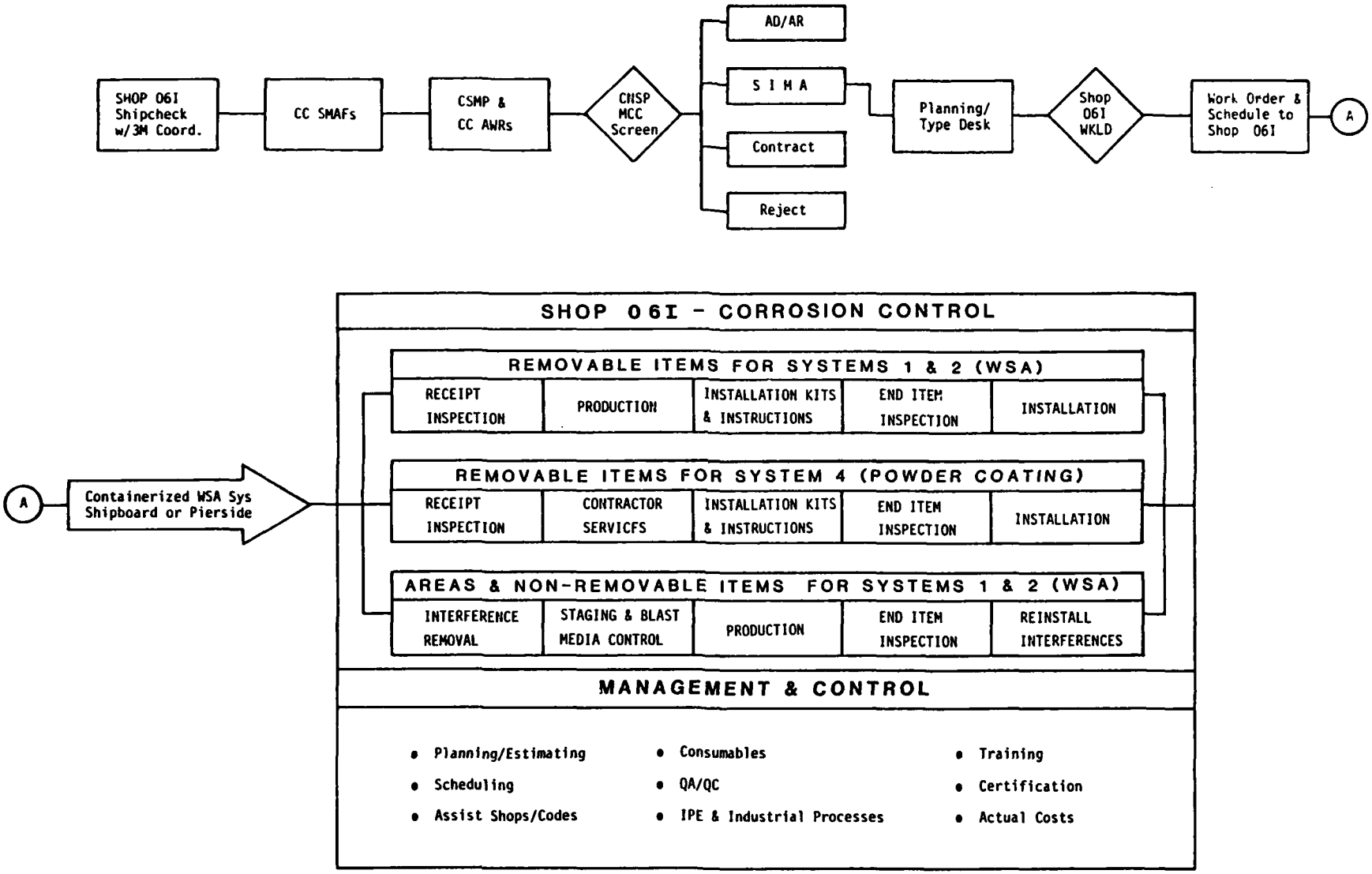


FIGURE 11-2 SHIPBOARD FUNCTIONAL FLOW FOR THE SERVICE TEST

DESCRIPTIVE INFORMATION	DATA ELEMENTS
1.0 Start-up & Pre-Production Activities 1.1 Technical Advice for Ships 1.2 Technical Advice for SIMA Codes/Shops	• Subj • References • Format • Purpose • User Audience • Date
1.3 IPE Installation, Checkout and "System Operability"	• Equip Name & Description • Planned vs. Actual Labor/ Material/Time • Log of Events/Actions
1.4 Training • CC Shop Personnel • SIMA Codes/Shops	• Subj/Lesson Plan • When Delivered/Duration • Tng Objective • Who Instructed • Reqd Knowledge & Skills • No. Students and Ratings . Certified • Tng Materials & Aids . Qualified . Flunked
1.5 Contractor Services	• Who • Cost: Labor/Material/ Time • Qualifications • End Item Inspection Criteria • Process Inst. • Accept/Reject Rate • QA/QC Prog. • Failure Analyses
2.0 Ship CC Work Request Preparation	• APL No. • Item Description (Size & Mat.) • Install. Rqmts. • Reqd CC Coatings • Dwg. No. • Availability Period • Quantity
3.0 SIMA Planning/Screening/Scheduling	• Other Material Requirements • Lead CC Shop • Assist Shop & Services

FIGURE 11-3. DATA ELEMENTS FOR THE PILOT CC SHOP SERVICE TEST

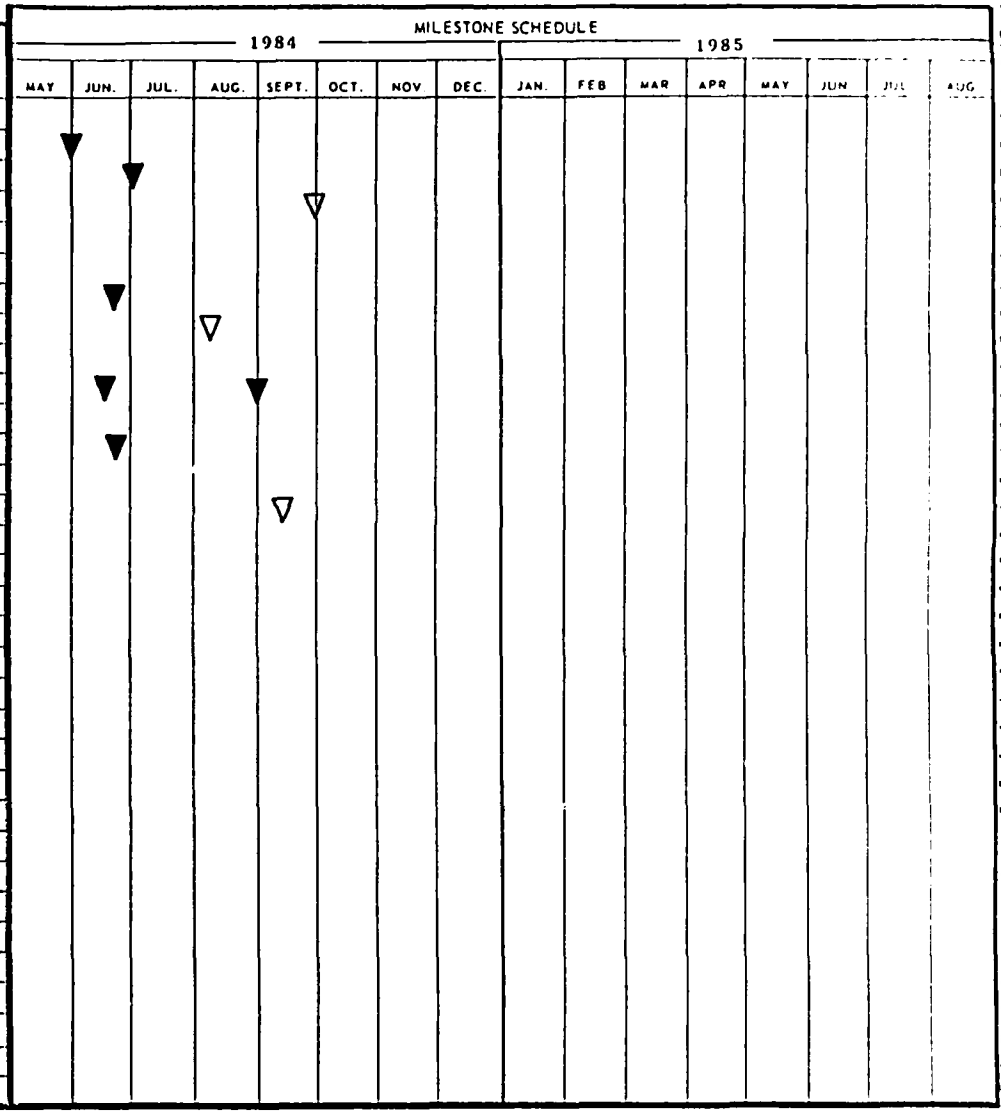
DESCRIPTIVE INFORMATION	DATA ELEMENTS
4.0 Production 4.1 Receipt Inspection & Log-In	• Item Description (Size & Materials) • CC Services Requested • CC Services Required • CC Services Designated • Installation Kit Makeup • Shop Production & QC Traveler
4.2 WSA Service	• In-Shop Work Per Process Instruction • End Item Inspection
4.3 Powder Coating	• Same as 1.5 • End Item Inspection
4.4 Management & Analysis	• Cost: . Productive Labor/Rating/Rate . IPE Operability/Maintainability . Processing Time . Consumables . Contractor .. Technical Services .. Production Services . Management/Administration . PM/CM . Procurement Activity . Inventory Control • QC: . Accept/Reject Rate . Failure Analysis & Correction • Safety & EPA • Mgmt Processes
5.0 Training 5.1 CC Shop Personnel 5.2 SIMA Codes/Shops 5.3 Ship's Force	Same as 1.4

FIGURE 11-3 (Cont'd)

DATA ELEMENTS FOR THE PILOT CC SHOP SERVICE TEST

POA&M for Pilot Corrosion-Control (CC) Shop - SHOP 06I

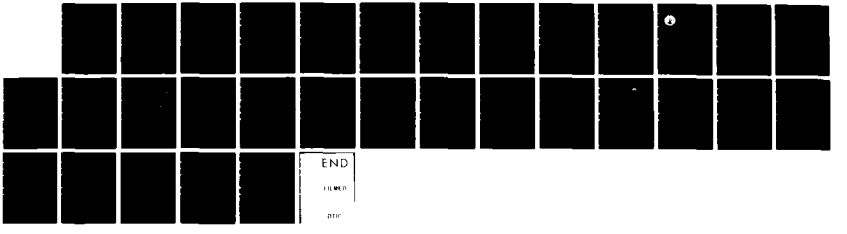
No.	MILESTONE DESCRIPTION	RESPONSIBLE ACTIVITY (Lead/Assist)	PLANNED DATE
A	ORGANIZATION (Tasks & Functions, Staffing)		
A.1	Issue Memo Establishing CC Shop	XO/STET	1 JUN 84
A.2	Assign CC Shop Number		2 JUL 84
A.3	Issue Tasks & Function Statements and the Intra-SIMA	XO/3800	1 OCT 84
	Organizational Relationships, including Cog		
	Planning Code		
A.4	Assign CC Shop Personnel		27 JUN 84
A.5	Issue Plan & Schedule for CC Shop Start-Up & Transition	3800/3000/XO	9 AUG 84
	of Shop 31M CC Services		
A.6	Complete WSA Training	3800/ISA	31 AUG 84
A.7	Issue Service Test Plan Draft	ISA	21 JUN 84
A.8	Conduct IPR of SIMA Pilot CC Shop ISA Draft Final Report	ISA/NOSC/CNSP/	29 JUN 84
		SIMA	
A.9	Issue SIMA Pilot CC Shop Final Report	ISA	14 SEP 84

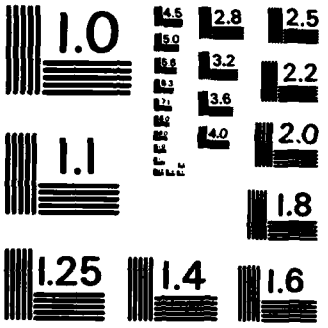


▼ : COMPLETED MILESTONE

▽ : SCHEDULED MILESTONE

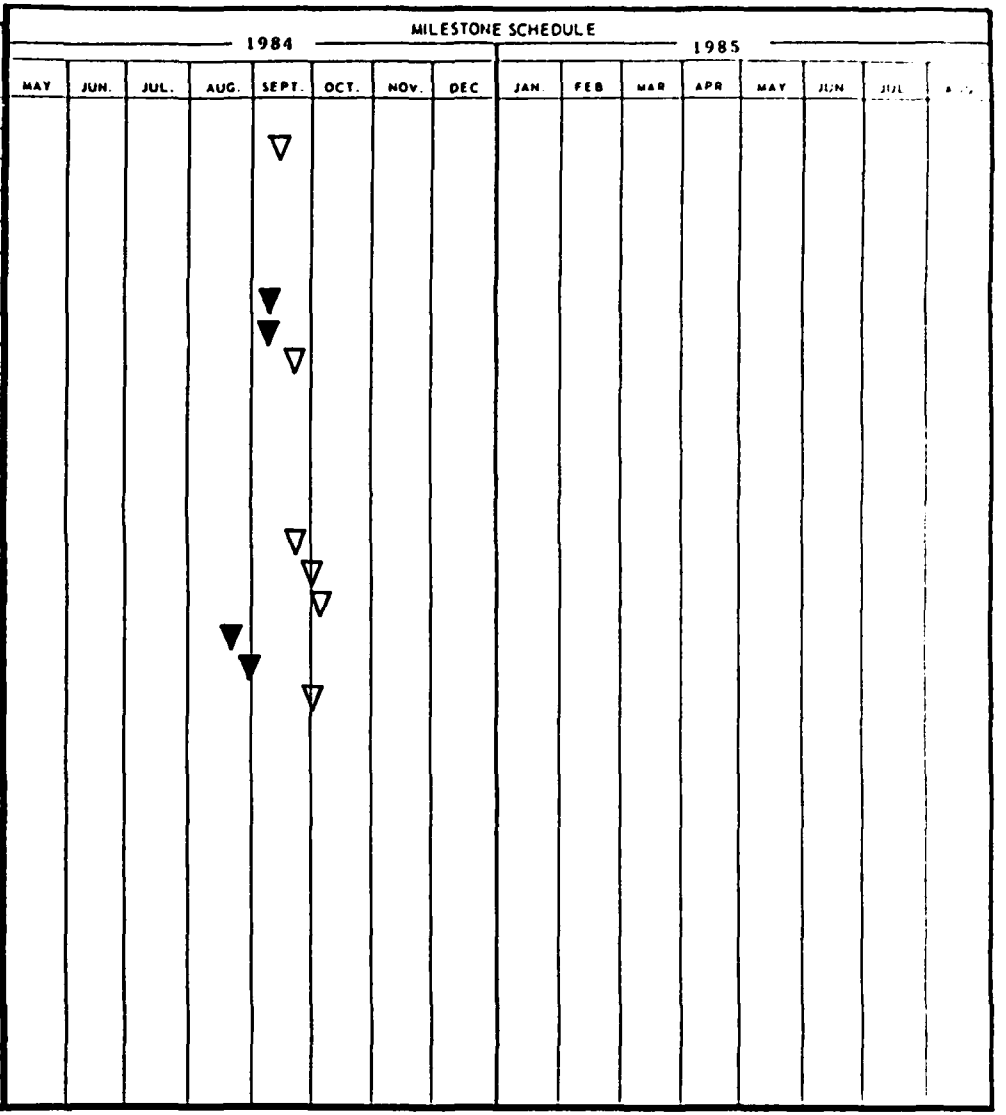
AD-A146 166 ASW AND SUPPORT-SHIP CORROSION-CONTROL (CC) PROGRAM 2/2
PILOT SIMA CC SHOP(U) INTEGRATED SYSTEMS ANALYSTS INC
NATIONAL CITY CA R A SULIT ET AL. 14 SEP 84
UNCLASSIFIED ISA(WC)-101 N66001-84-D-0032 F/G 13/8 NL





POA&M for Pilot Corrosion-Control (CC) Shop - SHOP 06I

No.	MILESTONE DESCRIPTION	RESPONSIBLE ACTIVITY (Lead/Assist)	PLANNED DATE
B	CC SHOP INSTALLATION		
B.1	Complete Bldg. 61 Plans	SHOP 06I	14 SEP 84
	. FSI Mod 5003		
	. Colateral Equipment		
	. QC Equipment		
	. Training Materials		
B.2	Commence Move-Out/Move-In NW Bay Bldg. 61	SHOP 06I	10 SEP 84
B.3	Start Procurement/Installation in Bldg.61	ISA/3850	10 SEP 84
B.3.1	Initiate Procurements	ISA/3850	17 SEP 84
	. FSI 5003		
	(9 Weeks Lead Time)		
	. Colateral Equipments		
	. QC Equipments		
	. Training Materials		
B.3.2	Comp. Instal. 5003	ISA	21 SEP 84
B.3.3	Comp. Instal. Colateral Equipments	SHOP 06I	1 OCT 84
B.3.4	Comp. Safety Inspections	SIMA 0140	5 OCT 84
B.4	Initiate Start-Up & System Training	ISA/FSI	20 AUG 84
B.4.1	Complete Start-Up/Training	ISA/FSI	31 AUG 84
B.5	Ready for Production Work	SHOP 06I/ISA	2 OCT 84

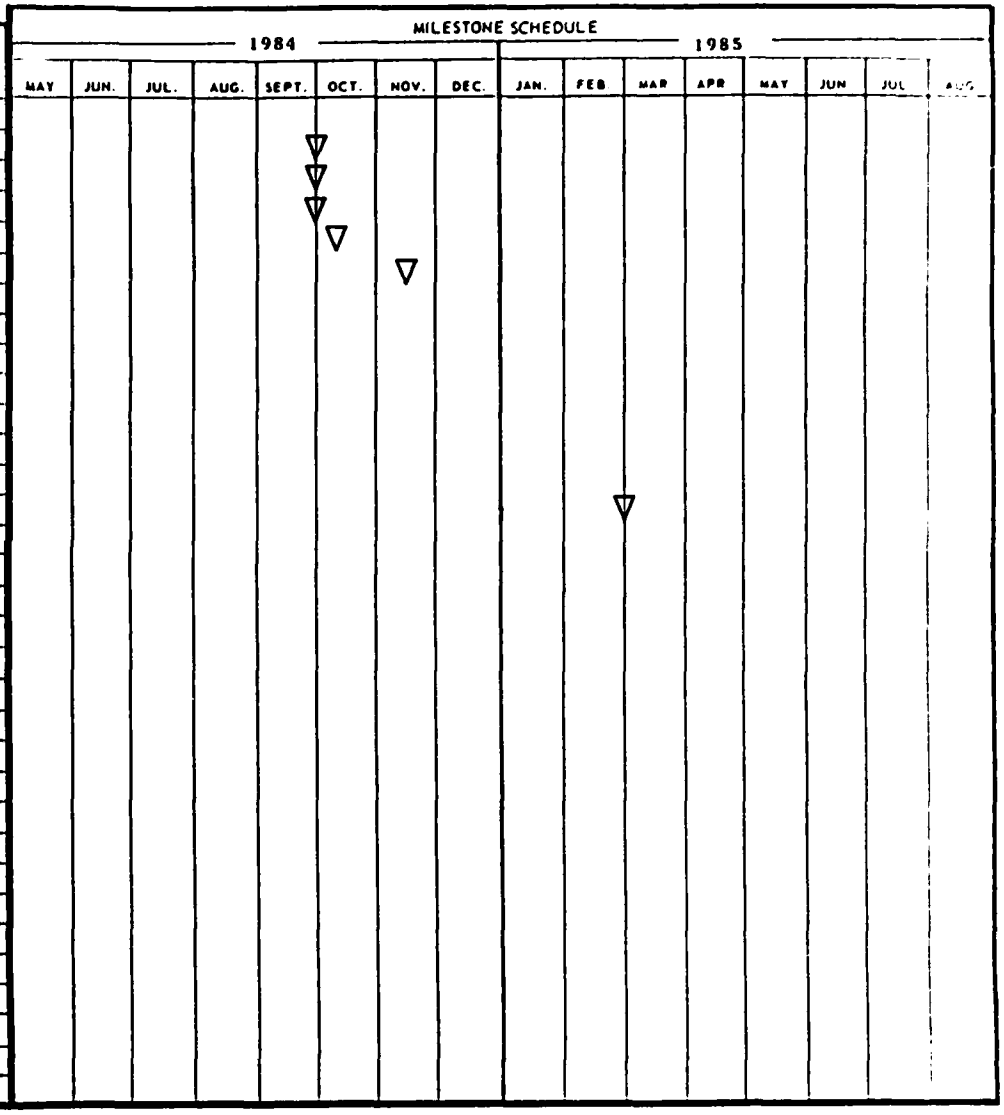


▼ : COMPLETED MILESTONE

▽ : SCHEDULED MILESTONE

POA&M for Pilot Corrosion-Control (CC) Shop - SHOP 061

No.	MILESTONE DESCRIPTION	RESPONSIBLE ACTIVITY (Lead/Assist)	PLANNED DATE
C	CC SHOP OPERATING INSTRUCTIONS/GUIDES		
C.1	Issue Synoptic Outline & POA&M	ISA/3800	1 OCT 84
C.2	Issue Intro-SIMA Code/Shop Functions & Responsibilities	XO/3800	1 OCT 84
C.3	Issue Process Instruction for NAVSEA CC Systems 1 & 2	ISA/1700	1 OCT 84
C.4	Issue Draft Process Instruction for CC System 4	ISA/1700	10 OCT 84
C.5	Issue Draft Guide for CC Evaluation & Control	ISA	15 NOV 84
	. Ship-to-Shop & Shipboard Services		
	.. Systems 1, 2 & 4 (by Contract)		
	.. Systems 3 & 6-15 for proper installation of		
	Items preserved with Systems 1, 2 & 4		
	. Job Control Records		
	. Service Test Planning/Production/QC/Info		
	Collection and Analysis		
C.6	Issue 1st revision of Draft Guide	ISA	1 MAR 85



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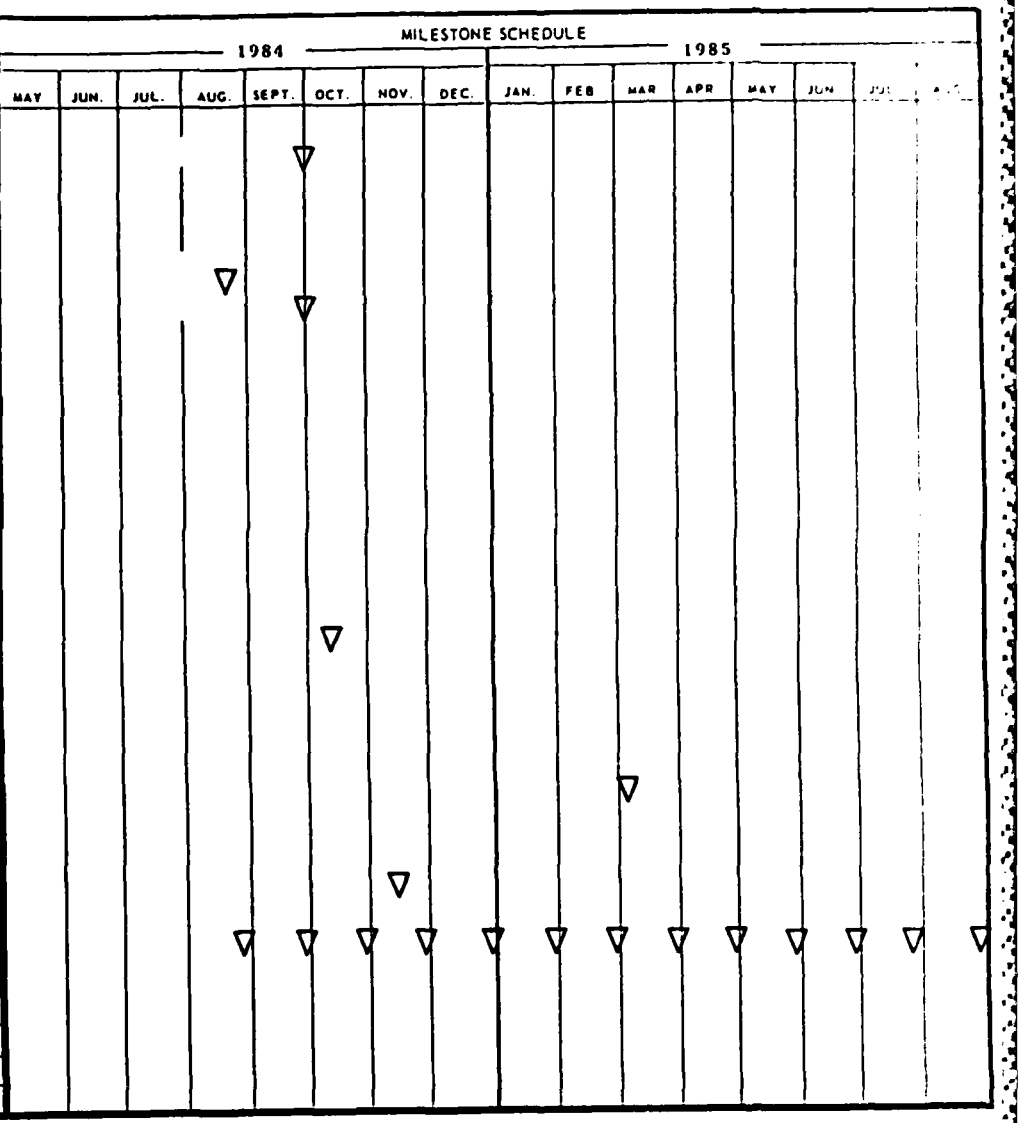
POA&M for Pilot Corrosion-Control (CC) Shop - SHOP 061

No.	MILESTONE DESCRIPTION	RESPONSIBLE ACTIVITY (Lead/Assist)	PLANNED DATE
D	TRAINING		
D.1	Issue Training Plan & Schedule	ISA	1 OCT 84
	. Training Objectives		
	. Task Analyses		
	. Lesson Plans		
D.2	Initiate Training	ISA/SHOP 061	20 AUG 84
D.2.1	CC Shop Personnel	ISA/SHOP 061	1 OCT 84
	. 15 NAVSEA CC Systems		
	. NSTM 631		
	. DoD-STD-2138		
	. CC Shop IPE		
	. Testing/Certification For Systems 1 & 2		
	. Testing/Qualification for other systems		
	. Shop organization and procedures: P/E; Production; QC; Service Test Data Collection/ Analysis; Product Accountability (Log-In, Shop Traveler, Log-Out)		
D.2.2	Other SIMA Codes/Shops	ISA/SHOP 061	10 OCT 84
	. P/E		
	. Production Shops, including Assist Shops		
	. Safety		
	. QA/QC		
D.2.3	Shipboard Mockups (Equip. Set-up, Surface Prep & Debris Control, WSA, Sealing, Topcoating, Equip. Removal and Clean-up)	ISA/ SHOP 061	4 MAR 85
D.3	Issue Compendium of Lesson Plans	ISA/ SHOP 061	15 NOV 84
D.3.1	Issue Update		
D.4	Issue Training Program Progress Report	ISA/ SHOP 061	Last Friday
D.5	S/F Training		
	. Installation and Maint./Repair (Shop-to-Shop)		
	. Assist SIMA for shipboard work		



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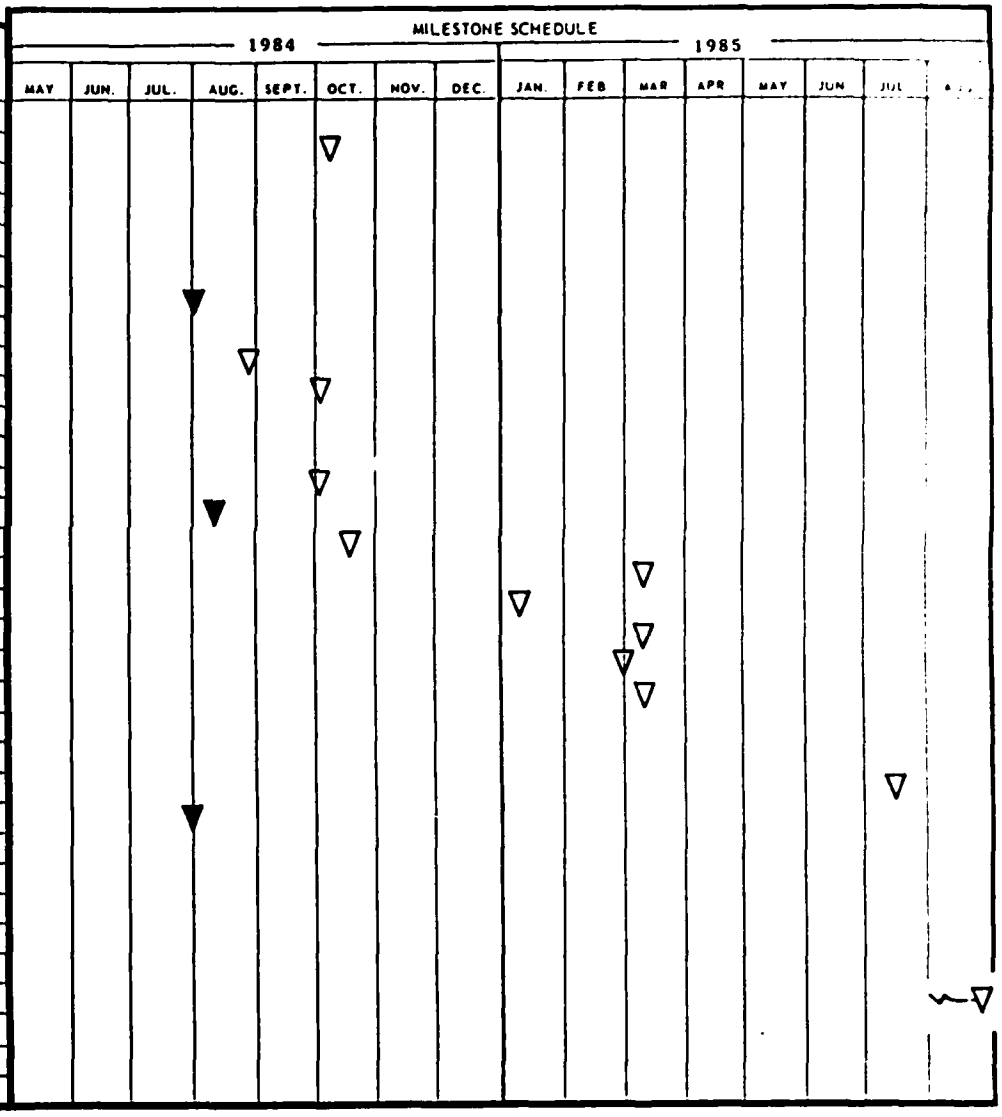
POA&M for Pilot Corrosion-Control (CC) Shop - SHOP 06I

NO.	MILESTONE DESCRIPTION	RESPONSIBLE ACTIVITY (Lead/Assist)	PLANNED DATE
E	PRODUCTION OPERATIONS		
E.1	Initiate Start-Up & System Training		8 OCT 84
	. Train/Certify Shop Personnel (In-Shop Training)	ISA/ SHOP 06I	
	. Establish Intra-SIMA Code/Shop Interfaces	ISA/SHOP 06I	
	and Modus Operandi		
	. Establish Service Test Requirements, SOPs & Reports	ISA	
E.2	Schedule 1st Ship-to-Shop Availability	ISA/SHOP 06I	1 AUG 84
	(USS ALBERT DAVID (FF-1050) for Planning)		
E.3	Complete Start-Up & System Training	ISA/SHOP 06I	28 AUG 84
E.4	Start Production Operations	SHOP 06I/ISA	2 OCT 84
	. Tect Advice for All Systems All Modes		
E.4.1	Start Ship-to-Shop Services		
	. Lead Shop: Systems 1, 2, 7, 8, 9 & 10 thru 15	SHOP 06I/ISA	2 OCT 84
	System 4 *Powder Coating Services*	SHOP 06I/ISA	10 AUG 84
	. Assist Shop: Systems 1 & 2 and Sys. 4 by Contract	SHOP 06I/ISA	22 OCT 84
E.4.2	Complete Ship-to-Shop Services	SHOP 06I/ISA	11 MAR 85
E.4.3	Start T/E In-Shop Mockups for Shipboard Services	SHOP 06I/ISA	10 JAN 85
E.4.4	Complete T/E Mockups for Shipboard Services	SHOP 06I/ISA	11 MAR 85
E.4.5	Complete Transition of Ship-to-Shop Services from 3850	SHOP 06I	1 MAR 85
E.5	Start Shipboard Services	SHOP 06I/ISA	11 MAR 85
	. Lead Shop: Systems 1 & 2		
	System 4 Powder Coating Services		
E.5.1	Complete Shipboard Services	SHOP 06I/ISA	15 JUL 85
E.6	Start Shop Reporting & Records for SIMA & Service Test	SHOP 06I/ISA	1 AUG 84
	. Daily Log & Analysis		
	. Weekly (Thursday)		
	. Monthly (First Thursday)		
	. Failure Analyses as required		
	. Special Reports as required		
E.7	Complete Service Test and Report	ISA/SHOP 06I	30 OCT 85



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APPENDIX A: CORROSION ELIMINATION MEMO AND LETTERS FROM COMNAVSEASYSCOM

SEA 00/EBF Memo, 24 OCT 83

SEA 07/JCM Ser 166 Ltr, 18 NOV 83

SEA 0743H/HL Ser 68 Ltr, 3 FEB 84

DEPARTMENT OF THE NAVY

NAVAL SEA SYSTEMS COMMAND

WASHINGTON D C 20362

IN REPLY REFER TO

00/EBF

24 Oct 1983

MEMORANDUM FOR REAR ADMIRAL MEYER
REAR ADMIRAL McARTHUR
REAR ADMIRAL DAVIS
COMMODORE RICKETTS

Subj: Corrison Elimination

1. The purpose of this memorandum is to place a new emphasis on our efforts to eliminate corrosive materials aboard ship.

2. I continue to hear repeated criticism about the time spent by ship's force in correcting the results of corrosive materials corroding in the highly corrosive atmosphere in which ships exist. We must make a new and vigorous effort to eliminate the introduction of any corrosive materials in ships. You are all familiar with the problem.

3. I want the following actions taken:

a. A vigorous enforcement of all specifications to prevent corrosive materials from being introduced in any procured material for shipboard use including GFE to contractors as well as prime contractor deliverables.

b. A continuing definitive review of specifications to introduce corrosion reducing features and to eliminate corrosive materials wherever possible and to place appropriate teeth in this to ensure enforcement (penalty clauses). SEA 05, SEA 06 and the projects should establish special interest items in each review process to ensure this feature is highlighted.

c. SEA 91 ensure that project managers have a special interest item for each quarterly progress review to ensure that contractors are taking effective action on corrosion reduction.

d. SEA 07 should ensure that SUPSHIPS have a special emphasis item to check contractor compliance and to ensure corrosive materials are removed from stock.

e. SEA 07 should ensure that Naval Shipyards have programs to reduce corrosive materials from stock to prevent its use in inappropriate places.

f. SEA 91 is requested to have a special information feedback program so that corrosive components such as life boat release mechanisms and solenoids as recently reported by INSURV are purged from our system.

g. SEA 00N, by copy of this memorandum, is requested to make corrosion reduction a special interest item for Command inspections.

Subj: Corrosion Elimination

2. Every effort will be made to bring corrosion as a problem under control and make it disappear. Anyone who has additional ideas please advise me.

E. B. Fowler

E. B. FOWLER

Copy to:
SEA 09
SEA 00N

DEPARTMENT OF THE NAVY

NAVAL SEA SYSTEMS COMMAND

WASHINGTON D C 20362

IN REPLY REFER TO
SEA 07/JCM
Ser 166
18 NOV 1983

From: Commander, Naval Sea Systems Command (SEA 07)
To: Commanders, All Naval Shipyards
Commander, Naval Ordnance Station, Louisville, Kentucky

Subj: Improved Materials or Processes Naval Shipyard Overhaul and Repair Work

Encl: (1) SEA 00 Memo - Corrosion Elimination of 24 Oct 1983

1. Enclosure (1) invited submission of ideas for eliminating corrosive materials aboard ship. I have broadened this request for information from Naval Shipyards and Naval Ordnance Station, Louisville to include recommendations for improved materials or processes for any part of ship overhaul and repair work.

2. I believe that there are a plethora of useful material and process improvement ideas in the Naval Shipyards and in the Naval Ordnance Station, Louisville that can effectively be brought to bear on our ship overhaul and repair work to improve productivity, longevity, maintainability, reliability, etc. It is requested that you dig down into your organization, ferret out these ideas, screen them with a common sense filter and forward them to NAVSEA 07 for consolidation and submission to appropriate technical authority. Since reference (a) asks specifically for corrosive material elimination recommendations, list these as a separate subset within your submission. Be sure and contact the real spark plugs within your organization so that significant stones are not left unturned.

3. It is requested that you complete the above by the end of calendar year 1983.

4. Supervisors of Shipbuilding and Repair are invited to submit recommendations if they desire.

5. You will get further direction on Para 3e and 3d of enclosure (1) but in the meantime start taking action on those paragraphs.

J. C. McARTHUR

Copy to:
Supervisors of Shipbuilding,
Conversion and Repair

bcc:

SEA 00	070M
09	072
08X	073
05	074
06	075
070	

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON D C 20362

IN REPLY REFER TO
SEA 0743H/HL
Ser 68
FEB 3 1984

From: Commander, Naval Sea Systems Command
To: Supervisors of Shipbuilding, Conversion and Repair, USN

Subj: Corrosion Elimination

Ref: (a) NAVSEA ltr 07/JCM Ser 166 of 18 Nov 1983

1. Enclosure (1) to reference (a) states that emphasis will be placed on efforts to eliminate corrosive material aboard ship. It further outlined actions required to ensure that both headquarters and field activities vigorously pursue corrosion elimination. Corrosion reduction applies to new construction, regular overhauls, and all other repair work.

2. Reference (a) invited SUPSHIP recommendations for material or process improvement ideas. This is particularly true for ships undergoing repairs or overhauls.

3. Enclosure (1) to reference (a) specifies actions to be taken by each activity. Accordingly, each SUPSHIP should ensure:

a. contractor compliance to material specifications.

b. receipt inspection procedures are adequate to detect materials which do not conform to specifications.

c. materials in stock are correctly identified and properly segregated.

d. corrective action is taken in those instances where corrosive materials are found.

4. Corrosion reduction will be a special interest item for Command INSGEN inspections. Corrosion reduction will also be an item addressed during SUPSHIP Operations Review Team (SORT) visits.

Martin Hill

Enclosure (1)

NO. 7100-18-84

EFFECTIVE: _____

CANCELS: Original Issue

PROCESS INSTRUCTION

SHORE INTERMEDIATE MAINTENANCE ACTIVITY, SAN DIEGO

NAVAL STATION, BOX 106
SAN DIEGO, CA 92136

TITLE: WIRE-SPRAYED ALUMINUM (WSA) FOR CORROSION PROTECTION; NAVSEA CORROSION-CONTROL (CC) SYSTEMS 1 & 2

SECTION:

I - EQUIPMENT
II - MATERIAL
III - SAFETY
IV - QUALITY CONTROL
V - OPERATOR TRAINING & CERTIFICATION
VI - METHOD
VII - FEEDBACK

ORIGINATOR CODE: 3800
SHOP 061

APPLICABLE SHIP TYPES: ALL

REASON FOR REVISION: ORIGINAL ISSUE

APPROVALS:

	DATE
ORIGINATOR: (7100/3800)	
PLANNING: (2000)	
REPAIR OFFICER: (3090)	
PRODUCTION: (3000)	
SAFETY: (0140)	
QUALITY ASSURANCE: (5000)	
ENGINEERING: (7000)	

REVIEW: Annually or whenever DOD-STD-2138(SH) is changed.

LEAD SHOP: Pilot Corrosion-Control Shop SHOP 061

ASSIST SHOPS: 72A 72C 11A 26A 17A 31M

CATEGORY: II (per COMNAVSEAINST 5250 (draft), NSY Thermal Spray Process Instructions are under PSNS as lead yard for development/changes; process must be followed by all NSYs)

REFERENCES:

A. DoD-STD-2138(SH), Metal Sprayed Coating Systems for Corrosion Protection Aboard Naval Ships, 23 NOV 81

B. NAVSEA Corrosion-Control Manuals for Ship Classes FFG-7, LHA-1, FF-1052, DD-963, AO-177, LST-1179 and CG-16

C. NAVSEA Shipboard Corrosion-Control Advisory (SCCA 6-83)

D. Naval Reserve IMA-7 Training Program, Corrosion-Control Using Wire-Sprayed Aluminum, CNAVRES (Code 323A)

E. NAVSEA 0655-AA-JPA-010, Job Performance Aid for Metal Sprayed Coating Systems, 30 MAY 83

STANDARD DISTRIBUTION: (1 copy unless noted otherwise)

Code:			Shop:			
	0140	3300		11A	38C	67A
	2000	3600		17A	38D	67E
	2160	3700		26A	41A	67H
	2161 (3)	3800		26B	51A	72A
	2162 (3)	5000		31A	51B	72C
	2163 (3)	7000		31D	56A	72E
	3090	7100		31M	56C	06I (12)
	3100	7200		31H	56D	
	3200	7300		38B	56E	

Shore Intermediate Maintenance Activity

Pearl Harbor	(2)
Alameda	(2)
Long Beach	(2)
Charleston	(2)
NAVAIRLANT	(2)
Little Creek	(2)
Mayport	(2)
Norfolk	(2)

NAVSURFLANT Readiness Support Group

NAVSHIPYD CHASN	(Code 380)	(1)
NAVSHIPYD LBEACH	(Code 380)	(1)
NAVSHIPYD MARE	(Code 380)	(1)
NAVSHIPYD PEARL	(Code 380)	(1)
NAVSHIPYD PHILA	(Code 380)	(1)
NAVSHIPYD NORFOLK	(Code 380)	(1)
NAVSHIPYD PUGET	(Code 380)	(1)
NAVSHIPYD Ports	(Code 380)	(1)
SUPSHIP Charleston		(1)
NAVSSES PHILA	(Code 053B)	(1)
DTNSRDC/ANNA	(Code 2803M)	(1)

ADDITIONAL DISTRIBUTION: COMNAVSEASYSCOM (SEA 05M1, 91AD121, 0704, 075) (1 copy each)

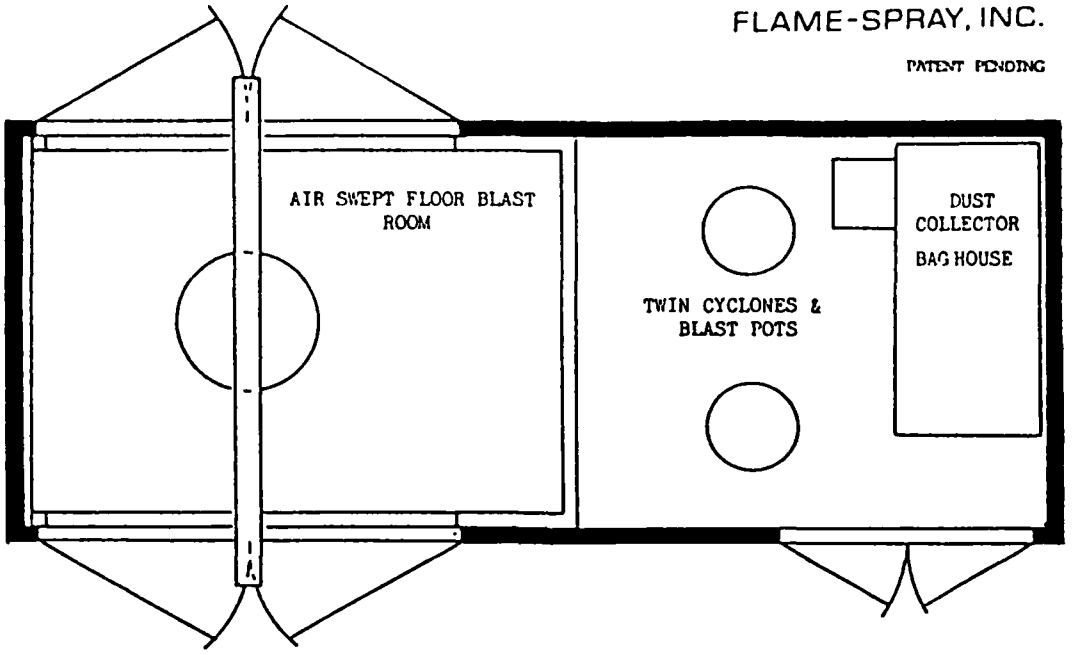
SCOPE: The scope of this process instruction covers the required equipment, method or industrial process, safety, quality control and personnel training/certification required for applying the NAVSEA Corrosion-Control (CC) Coating, Systems 1 & 2 (high- and low-temperature wire sprayed aluminum (WSA)) (Ref. A) to ferrous and aluminum-alloy substrates in accordance with Ref. B.

SECTION I

EQUIPMENT

1.1 The equipments specified in this process instruction shall conform to DOD-STD-2138(SH) (Ref. B). The portable/containerized WSA system, planned for the SIMA Pilot CC Shop installed in the West End of Building 61, has been designed and fabricated to meet these requirements.

1.2 Figure 1 and 2 give the equipment description and arrangement plan for the portable/containerized WSA system planned for the Pilot Service Test. The Flame Spray, Inc. (FSI) Model 5003A Blasting Unit with monorail and Model 5003B Thermal Spray Unit with monorail are planned. These units will handle components up to six feet in any dimension and provide a 2,000 lb. hoist/monorail. The Thermal Spray Unit also has a dessicant air dryer to provide clean dry air for anchor-tooth blasting and wire spraying. The METCO Model 12E combustion wire gun is used for spraying. A 100 psi, 250 cfm electrically powered air compressor is supplied with the FSI 5003 system.



EQUIPMENT DESCRIPTION

MODEL 5003 CONTAINER "A" BLAST CABINET - SIDE LOAD

(Size: 8' x 8' x 20 / Weight: 13,500 lbs.)

1. Self-contained Abrasive Blast Room, for use in strip blasting and anchor-tooth blasting for the Wire-Sprayed Aluminum Process.
   Capacity: 7-1/2' high x 7-1/2' wide x 10' long

2. A twin 600-lb. Abrasive Pot System is used to rapidly change grits from strip blasting to anchor tooth blasting.

3. 1 each Monorail with 2,000 lb. hoist.

4. 1 each 48" Floor Mounted Turntable.

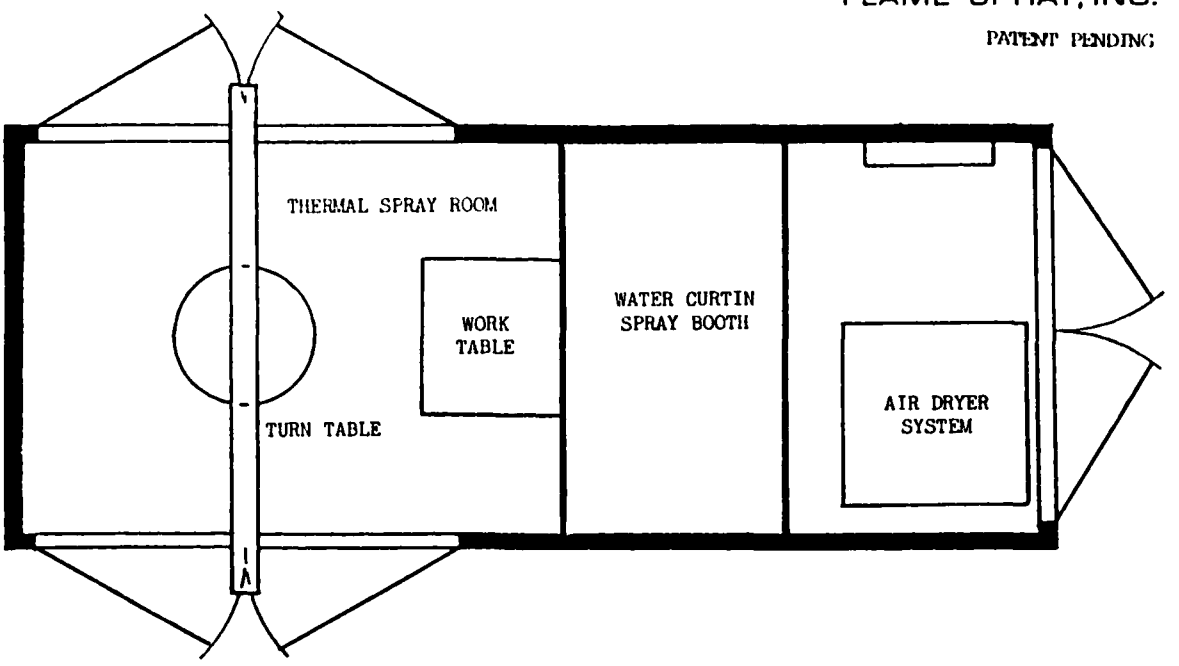
5. A completely self-contained Dust Collector System is included which meets all air pollution and safety requirements.

6. All blasting safety equipment and hoses and lighting are also supplied.

FIGURE 1A. Portable/Containerized WSA System
FSI Model 5003A, Side Loading Blasting Unit

FLAME-SPRAY, INC.

PATENT PENDING



EQUIPMENT DESCRIPTION

MODEL 5003 CONTAINER "B" SPRAY FACILITY - SIDE LOAD
(Size: 8' x 8' x 20 / Weight: 14,000 lbs.)

1. 1 each - Air Drying System modified for Wire Sprayed Aluminum applications meeting air quality requirements of DoD-STD-2138(SH).
2. 1 each - Water Wash Spray Booth modified to meet air pollution requirements and safety requirements. Work area - 7'10" wide x 10' long x 7'10" high.
3. 2 each - Combustion Wire guns and all related hoses, gauges, flow meters and wire racks.
4. A 3-month supply of spare parts for the above mentioned equipment.
5. Electrical Distribution Panels - approved power panels and all safety switches and supplies.
6. Miscellaneous Equipment:
   - 2 each - Work benches (collapsable) - Air Piping Distribution all valved compressed bottle gas storage rack. All venting (intake and exhaust) vents, lockable roof ladder - removable roof - exhaust stock - watertight seals.
   - 1 each - Turntable (removable)
   - 1 each - 100 psi, 250 cfm electrically-driven air compressor
7. Safety and quality assurance equipment supplied to meet the requirements of DoD-STD-2138(SH).

FIGURE 1 B. Portable/Containerized WSA System - FSI Model 5003B, Side Loading Thermal Spray Unit

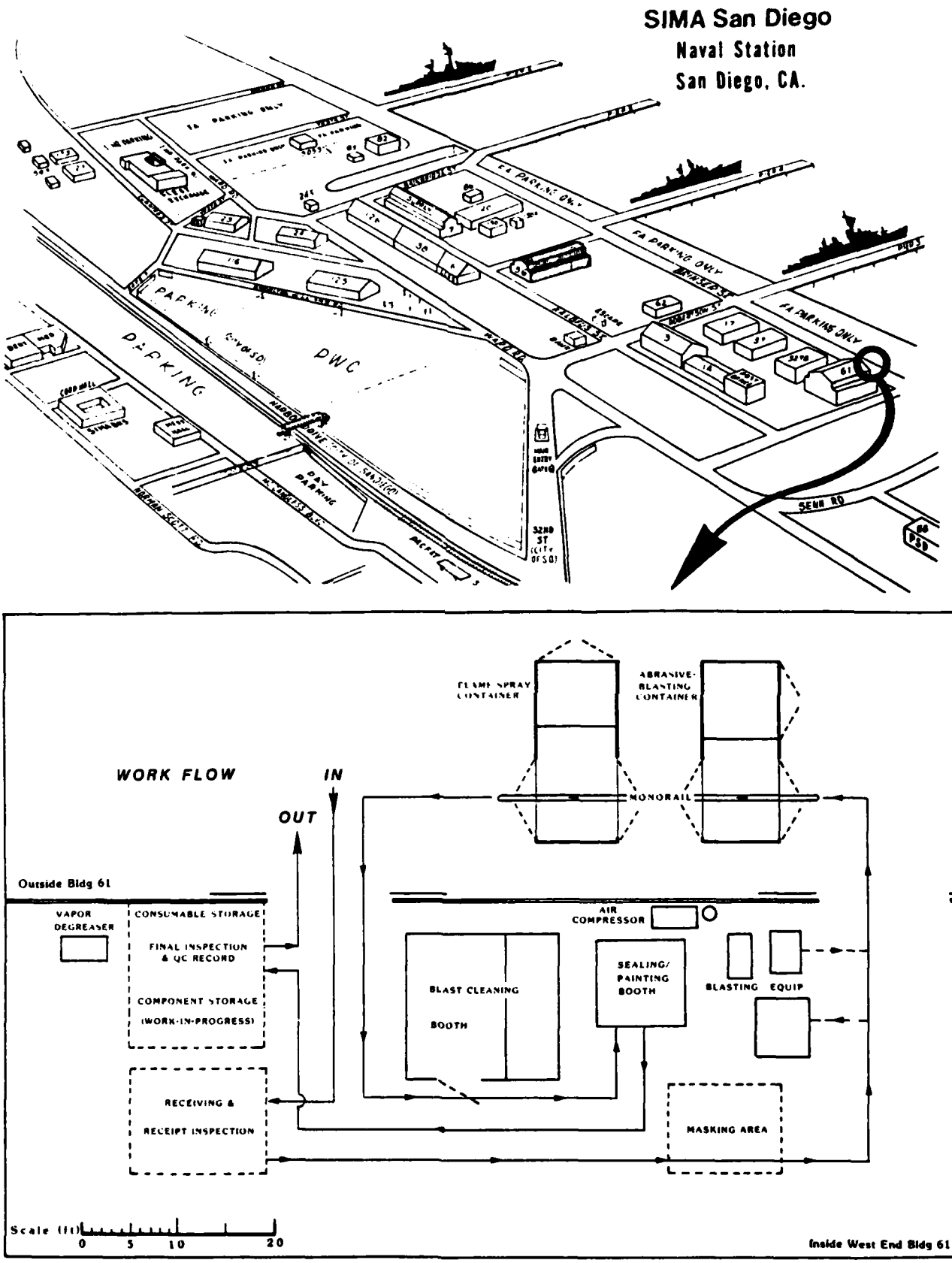


FIGURE 2. PILOT CC SHOP ARRANGEMENT - BUILDING 61

SECTION II

MATERIAL

2.1 ALUMINUM WIRE

Aluminum wire used for CC Systems 1 and 2 shall conform to MIL-W-6712. Wire surfaces shall be clean and free from scale, corrosion products, oil or other material which will adversely affect the application, density or adhesion of the coating. The wire shall be of uniform composition and quality, and free of seams, cracks, nicks or burrs. The wire shall be stored and handled carefully and uncoil readily and be free of bends, kinks or slivers that would prevent its passage through the spray gun.

2.2 GASES

Gases used for thermal spraying aluminum wire shall conform to:

Gas	Specification
Oxygen	BB-0-925
Acetylene	BB-A-106

2.3 ABRASIVE BLASTING MEDIA

2.3.1 Rough Blasting for Cleaning

Any clean and dry blasting media and particle size may be used to clean painted, rusted/oxidized and previously WSA'd surfaces. Finer grit sizes, about 60 - 100 mesh, should be used to remove paint and WSA coatings.

2.3.2 Anchor-Tooth Blasting

Abrasive blasting particles used to provide the anchor tooth of 2 to 3 mils during final surface preparation of the substrate shall be one of the following:

Type Abrasive	Mesh Size	Surface to be Blasted
Aluminum Oxide Grit	16 - 30	Steel or Aluminum
Angular Chilled Iron Grit	25 - 40	Steel

2.3.2.1 Restrictions

A. Abrasive particles shall be clean, dry, sharp and free of rust and excessive fines.

B. Abrasive particles shall not contain any feldspar or other mineral constituents that tend to break down and remain on the surface. Abrasive particles that have been used for cleaning contaminated surfaces shall not be used for final surface preparation, even if the abrasive has been rescreened.

C. Iron grit shall be reasonably sharp and clean. Grit that is rusty, noticeably worn, or dull when compared with new grit under 10X magnification shall not be used.

D. Iron grit shall not be reused for anchor-tooth blasting. Angular chilled iron grit shall not be used for blasting of aluminum. Use of iron grit on soft aluminum substrates may result in iron bits becoming embedded in the surface, possibly causing corrosion under the coating and early failure.

2.4 MASKING MATERIALS

Any masking material that provides adequate protection of the substrate through both the abrasive blasting and thermal spraying operations without causing substrate corrosion or contamination may be used. Acceptable masking materials include various tapes, plastic caps or plugs, hose sections and wood or metal inserts.

The preferred masking tape is:

Hi-Temp Al Foil Tape (0.007" thick, 3/4" wide x 36 yd. per roll, Stock No. 06004)
T&F Division of SHR Industries
3660 Edison Place
Rolling Meadows, IL 6008
(312) 392-8090

2.5 Cleaning Solvents

Toluene conforming to TT-T-548 and trichloroethane conforming to O-T-620C are approved cleaning solvents.

WARNING:
Toluene is flammable. Both toluene and trichloroethane are toxic. Use only in well-ventilated spaces. Do not use near open flames, blasting, thermal spraying work, or sources of sparks. Do not allow prolonged contact with bare skin. Read and follow precautions on container shipping labels before using contents.

2.6 Quality Control

The following tape is required for measuring anchor-tooth profile:

Press-O-Film (X-course)
Testex, Inc.
P.O. Box 867
Newark, Delaware 19711

SECTION III
SAFETY

Section 4 of DoD-STD-2138(SH) applies (Ref. B).

SECTION IV
QUALITY CONTROL

The quality control (QC) trade practices for thermal spraying in conformance with DoD-STD-2138(SH) and the Thermal Spray Manual of the American Welding Society will be followed. A summary of the major QC elements follow.

4.1 SET-UP OR PRE-PROCESS

Item	Para. Ref. in DOD-STD-2138(SH) (Ref. B)
A. Equipment and facility certified	5.1 & 5.2
B. Spray operator certified	5.4
C. Production QC records	5.5 & 5.7
D. Application procedure (equipment and spraying parameters and procedures) certified	5.3 & 5.6

4.2 IN-PROCESS

Item	Para. Ref. in DOD-STD-2138(SH)
A. Substrate cleaned	4.4
B. Properly masked	4.4.2
C. Anchor-tooth blasted	4.4.3
D. Proper oxidation/contamination protection and elapsed time between anchor-tooth blasting and spraying used	4.4.4
E. Substrated heated to 220°F (or starting area for large components)	—
F. Proper spraying technique (90° - 45°, 5-8" standoff, velocity to produce 3-5 mils/pass, and move to minimum overspray) used	—

Item	Para. Ref. in DOD-STD-2138(SH)
G. Coupon bend test acceptable	5.5.3 & 5.6.3
H. Visual inspection satisfactory	5.5.2.1
I. Thickness controlled and measured	4.4.5 & 5.5.2.2
J. Sealer coat properly applied	4.4.4.3/.4/.5

4.3 END ITEM

Item	Para. Ref. in DOD-STD-2138(SH)
A. Production record satisfactory	5.5.1
B. Inspection (coupon bend test, visual and thickness)	5.5.2
C. Properly sealed	4.3.6 & SSCA-6-83 (Ref. C)

SECTION V

OPERATOR TRAINING AND CERTIFICATION

5.1 TRAINING

Personnel shall be trained for applying the WSA CC Systems 1 and 2 using the following references:

- o DoD-STD-2138(SH) (Ref. B);
- o NAVSEA 0655-AA-JPA-010, Job Performance Aid For Metal Sprayed Coating Systems (Ref. E);
- o Naval Reserve IMA-7 Training Program, Corrosion Control Using Wire-Sprayed Aluminum (Ref. D);
- o Equipment Manufacture Operator and Field/Factory Maintenance Instructions; and
- o This Process Instruction.

5.2 CERTIFICATION OF OPERATORS

Section 5.4 of DoD-STD-2138(SH) applies.

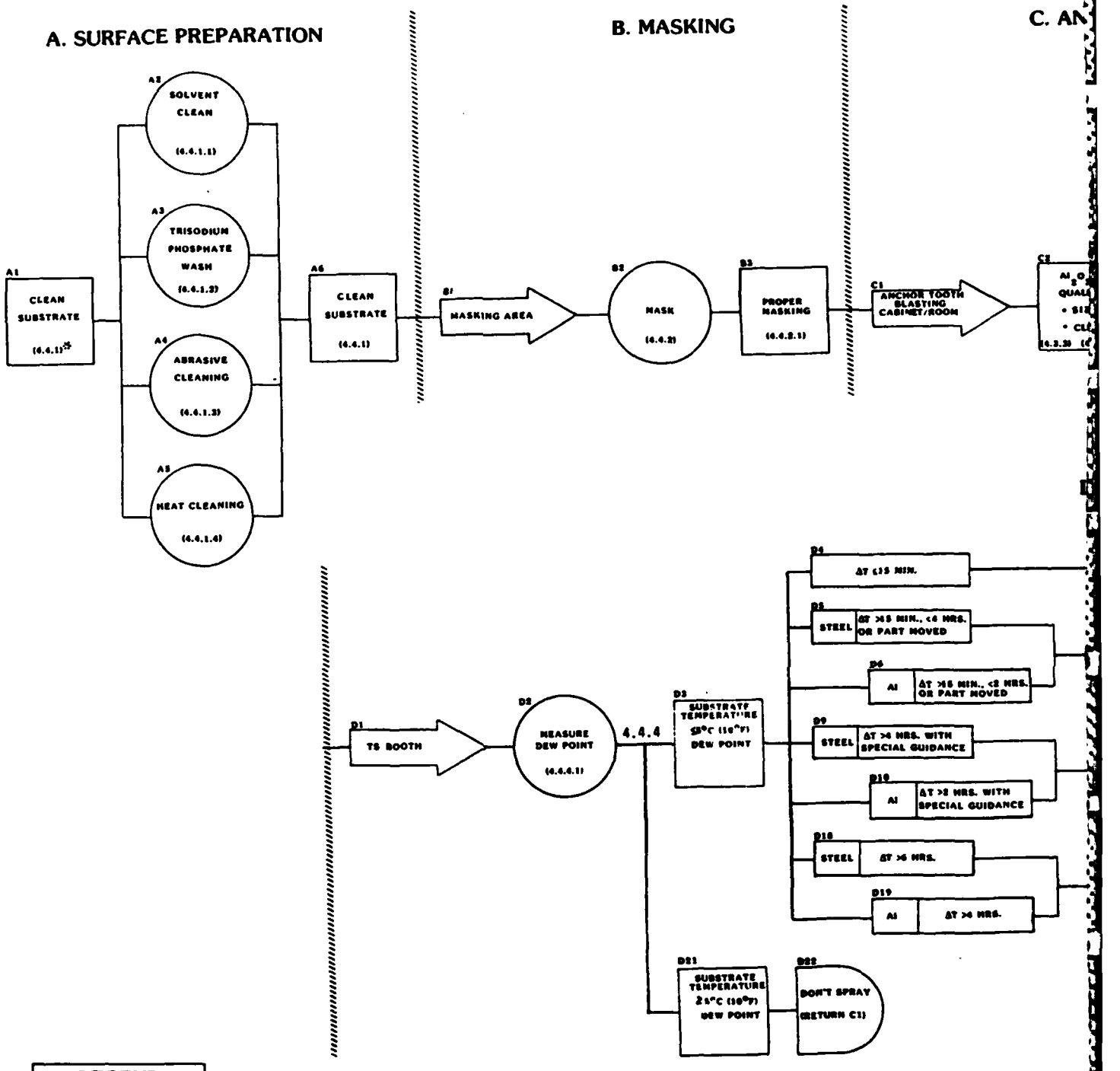
SECTION VI
METHOD

The method for applying the WSA CC Systems 1 and 2 is given in Figure 3, Production Flow Chart. The spraying parameters for the METCO 10E, 11E and 12E flame-spray guns are given in Figure 4.

SECTION VII
FEEDBACK

In addition to the daily supervision of production and quality control, the following "feedback" indications will be used to monitor and maintain/improve the quality and productivity of the CC Shop:

- Verbal and written reports from customer ships and shops.
- Weekly analysis of the CC Shop's:
  - Production input to output;
  - Labor and materials consumed;
  - PM/CM activity;
  - QC activity and results;
  - Product degradation/failure reports; and
  - Operator training/certification.



* Para. No. from DoD-STD-2138(SH)
Δt - time between end of anchor-tooth blasting & start of thermal spraying

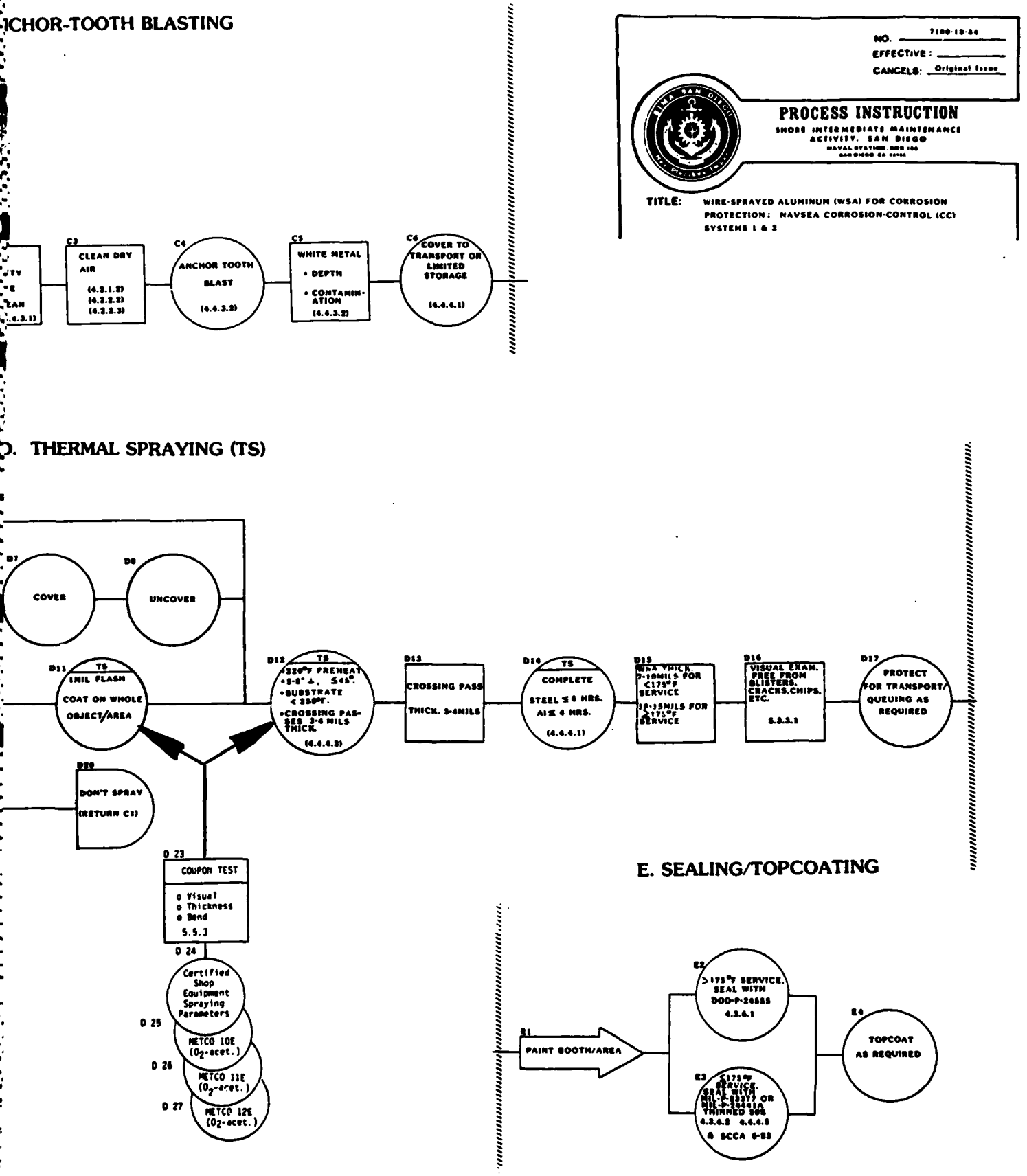


Figure 3 Production Flow Chart

FIGURE 4 **WSA Spraying Parameters for the METCO Flame Spray Guns Using 1/8-inch Aluminum Wire**

METCO GUN	Air Cap	Lighting Pressure—PSI*			Flowmeter Readings			Consumption Per Hour		
		Oxygen	Acetylene	Air	Oxygen	Acetylene	Air	Oxygen Ft.³	Acetylene Ft.³	Wire Lb.
10E	EC	30	15	65	44	40	53	90	40	12
11E	3	35	15	75	42	42	54	80	40	12
12E	EC	35	15	70	43	40	52	83	40	12

1. Industrial process must be in conformance with DoD-STD-2138(SH).

2. Sprayed Material: 1/8-inch aluminum wire certified to MIL-W-6712B.

3. Preheat all small components and the "starting area" of large components or structures to 150° - 200°F.

4. Gun-To-Work Distance: 5 to 8 inches, ±45° from ⊥.

5. WSA Coating Thickness Per Pass: 3 ± 1 mils .

6. Final Coating Thickness: 10 ± 3 mils .

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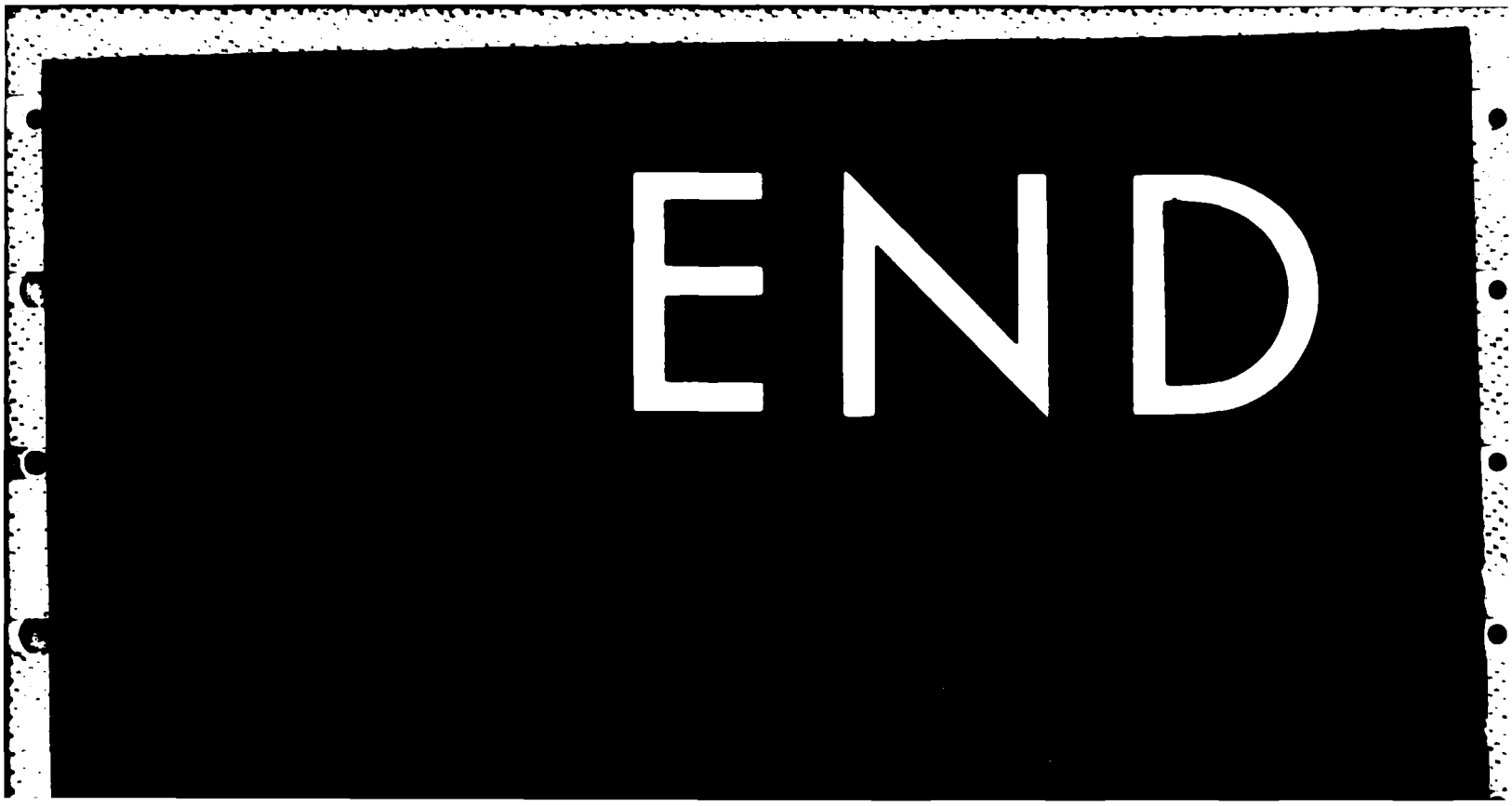
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